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The Tensile Strength of Rayon Fibers

The Search for Improvement in Yarn Strength—Comparison of the Various Rayons as to Properties—No Improvement in Twenty Years—Strength Tests and Conclusions—Comparative Study of the Rayons—Educating the Consumer

By FRED. GROVE-PALMER

WHEN nitro rayon was first shown to the public as a commercial proposition at the Paris International Exposition in 1889 by the late Count de Chardonnet and his colleague, Count Callimachi, the principal defect that was noticeable in the fiber was the great decrease of tensile strength when the yarn was wetted. Even when dry, this property was not particularly great; but as soon as the material got wet or damp, most of what little strength it ever had practically disappeared.

Ever since that time, and notably during this decade, when the use of rayon in all its various forms has assumed a world-wide importance, all the vast army of research workers, chemists and physicists alike, have been turning their attention in no small degree to introducing such improvements into the fiber as will make it less open to attack from moisture, which, from the very nature of things, is the chief enemy it is called upon to face.

The manufacturers of Viscose in Europe have vied with those at home in their strong endeavors to discover some means whereby their yarns may be improved in this respect, but it must be confessed that all their work during the last twenty years or so has been entirely unsuccessful. From the point of view of luster, of handle, and of many other properties, they have made enormous progress; but as soon as Viscose is allowed to absorb moisture, its tensile strength is reduced by something in the region of 50%.

It is not quite the same in the case of Celanese, or, more correctly, "cellulose acetate." (Celanese is the patented name of one variety of cellulose acetate, of which there are several kinds, each with somewhat different characteristics.) In passing, it may be mentioned that in the near future, when some of the companies that have been recently formed begin operating, there will be a considerable number of acetate rayons for the dyer to deal with. This type of rayon does not have the same rapidity of absorption of water as is found with Viscose and the other rayons, and because it absorbs moisture more slowly the time during which the reduction of strength takes place is considerably lengthened. But in the end it does take place.

The principal kind of rayon is Viscose, a form of regenerated cellulose; this is an alternative way of saying that it is cellulose which has been dissolved in suitable alkaline solvents to a semi-solid state, from which threads are extruded, and from these in their turn the solvents are removed, leaving behind the cellulose itself in the shape of long filaments that are capable of taking up water with the utmost ease. The cellulose acetate product, however, has very different characteristics, because it is not plain cellulose but cellulose in which certain parts known as the hydroxyl groups, expressed in chemical formulas as (OH), have been either wholly or partly replaced by acetyl groups, (CH_3CO). The more complete this replacement has been during the manufacture of the cellulose acetate, the less absorptive becomes the product in the finished state; and though this might be valuable from the point of view of its strength, it seriously inconveniences the dyer in the later stages of the work, as was well known in the earlier days of the use of the fiber. As a result of this, it has been a good policy to effect a kind of compromise whereby the number of replacing acetyl groups is reduced to those sufficient for the comparatively easy wetting and dyeing of the fabrics, and a corresponding reduction in strength is known and faced.

Similarity of Nitro and Acetate

Ever since Miles put the first really practicable Acetyl rayon before the public in 1905, it has been customary to stop the acetylization of cellulose several

stages before it reached completion, but all the time research has been continued with a view of effecting the increase of wet strength in other ways. In spite of innumerable patents, however, none has met with the success that has been desired, although very considerable improvements have been brought about in the other qualities of this interesting and beautiful fiber.

Nitro rayon and the acetate have a certain similarity when they both are in the stage of being newly extruded filaments; this likeness lies in the fact that both of them are compounds, esters, of cellulose. In the one, as has been already mentioned, some of the hydroxyl groups in the cellulose molecule have been replaced by groups representing acetic acid deprived of its water; in the other those same hydroxyl groups are in part replaced by nitro groups. From that time, however, a difference is introduced; for while the Acetyl rayon is merely washed, the nitro rayon has to pass through the process of "denitration," by means of which the nitro groups are removed from the molecule and there is left behind simply a regenerated cellulose. The necessity for doing this is at once obvious when it is recollected that nitrocellulose is just a form of inflammable explosive, of which guncotton is a type. It would be impossible to permit the women of the nation to clothe themselves in an apparel of modified guncotton, with the danger of the spark from a cigarette setting their clothes on fire. As soon as the material is rendered more or less non-inflammable and appears as regenerated cellulose, it is able to absorb water and loses half its tensile strength.

A form of rayon that is coming more prominently into view and of which large quantities are promised for the near future is the Cuprate, or cuprammonium fiber. Here is a fiber of different construction from that of the two last-mentioned types of rayon, but more closely resembling Viscose in that it is a solution of cellulose pulp or fiber in a mixture of copper sulphate with ammonia. A semi-solid plastic mass is made, and after further dilution and other suitable treatment the thread is produced in rather a different manner to that adopted for the other kinds of filaments. The nature of the solution is such that as the filament is pushed out of the spinneret it can be stretched to a very considerable extent, with the result that the threads produced are far finer than those obtainable from any of the rest. It is to this that Cuprate rayon owes its superiority; but the difficulty that prevented its more general adoption as a marketable product was the cost of production owing to the large quantity of copper that is used and has not been recoverable. The latest improvements in the methods of manufacture have, however, done away with this trouble, and it is now stated that Cuprate rayon can be delivered in quantity as cheaply as Viscose. But in this case, as in all the others, the decrease of strength when wet still remains the principal fault, for here again we are presented with a regenerated cellulose having all the defects that are inherent in the substance.

The acetylization of cellulose adds to its weight; the same thing occurs in the nitration; but the denitration, of course, removes this added weight, while the subsequent treatment of the acetate does not. But if in this fiber, at some later stage of the processes through which it must pass before appearing on the counter as a finished fabric, there is caused a saponification of the yarn, not only is the weight reduced proportionately but the luster is partly destroyed and the tensile strength very greatly reduced.

This strength, whether it is in the wet or the dry condition, is lower than that of the regenerated celluloses, and consequently it is necessary to exercise every care to prevent this saponification from taking place and so causing a still greater weakening.

No Improvement in Twenty Years

We have been told on excellent authority that careful tests have been made with a view to comparing the tensile strengths of the present-day improved rayon yarns with a series of yarns that have been kept in storage ever since they were spun some twenty years ago; the result of these tests goes to show that little if any improvement in tensile strength has taken place during the past score years, which tells a disastrous tale of a great amount of wasted effort on the part of the scientists, while at the same time it speaks very highly of the care and skill of those earlier workers in the industry who were able to set a pace that has challenged subsequent mill crews.

This view may be said to be the obvious one drawn from a study of the results of these comparisons, but the writer is inclined to look at the matter from another standpoint, which is that in regard to tensile strength the limit was reached right at the beginning and that, so far as that property is concerned, nothing more can be done until there has been a radical alteration in the method of manufacture which will lead to the production of filaments that are not merely regenerated cellulose as we know it, but an entirely modified variety of this material. This view has the merit, at least, of helping to save the face, as the Chinese say, of the investigators. Though they may have failed in this respect, they have made enormous progress with improvements in all the other directions.

Additional interest in this very important matter of tensile strength may be obtained by a study of the figures that have been drawn from a comparison of dry yarns with wet. Strictly speaking, the strength of all the synthetic cellulosic fibers should be compared with that of the natural fibers of the same constituent, such as cotton or flax, but because the counts of these yarns are so very much larger or higher than the usual run of synthetic fibers, such comparisons would scarcely be just to either, because to spin yarns

of equal counts or deniers would either give cotton of abnormal fineness or rayon of unmarketable coarseness. It is therefore more usual to speak of rayon and its strength in terms of silk; with which, however, it compares very unfavorably, silk being of a very different constitution and of considerably greater strength. But as we do get yarns of similar fineness, there is not any very grave objection to taking silk as the standard which rayon should endeavor to meet. In those countries in which rayon is habitually spoken of as "artificial silk," this comparison with silk comes naturally and leads inevitably to disappointment.

The table of figures which follows shows the results of a long series of elaborate researches made by King, of Leeds University (England), who went very thoroughly into this subject of the loss of tensile strength on the wetting of rayon; they are quoted from "Manufacture of Artificial Silk." * All the well-known makes of rayon are shown; some meagerly, others in a more extensive way. The conditioning of the yarns that were used for this series of tests consisted of keeping them for around thirty hours in a room in which the air was mantained at a constant temperature of 21° C. with a humidity of 70%. The figures given in the table, however, have been corrected to a standard of 15° C. with a humidity of 66%, which may be regarded as normal conditions. The conditioned skeins were cut through and spread out, and from them were taken twenty strands, each measuring one-half meter in length. The usual custom for taking such tests is to wind the hank and then cut from it a large number of necessary pieces; but repeated trials proved that the method adopted gave equally reliable results with a fewer number of test pieces.

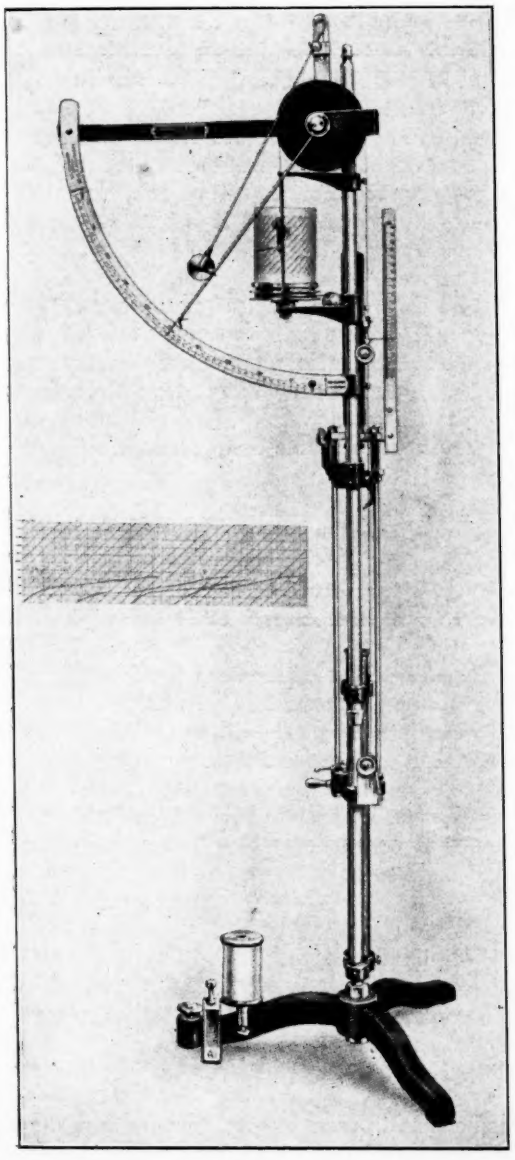


FIG. 1

THE TESTING APPARATUS

There are a number of suitable machines on the market for the recording of such tests as these, and it is largely a matter of opinion as to which of them is the best for the purpose. The type that is most suitable for the work is one of the deadweight variety, and the one illustrated (Fig. 1) has been chosen because of its perfect smoothness of running and the concordant results that are obtainable in its use. It is for use with single threads; a large number of single threads will yield a better idea of the strength of a fiber than the breaking of small hanks. This machine is worked with an oil plunge traverse for the sake of smooth working, and it is fitted with an attachment for taking the diagram of the stress-strains as they are applied. For actually revealing what occurs during the application of the strain on the thread this system of recording the stress diagrammatically is really an essential, and is of the utmost importance from the point of view of getting useful information as to what is really happening to the thread during the period the strain is being applied before it eventually succumbs to the stresses set up within it. Incidentally, these diagrams are of great value as permanent records for subsequent reference; but if there is no call for them the machine may be worked without this part of the mechanism.

The attachment of fresh charts to replace those on which records have been made is a very simple matter, occupying only a few seconds. The makers supply the machine for use in the cotton mill and another size more closely adapted for use with silk and rayon yarns; in this case the length of the test threads is half a

*Wheeler, 1928, London.

TABLE I

	Tensile Strength (grams per denier)		Elongation	
	Dry	Wet	Dry	Wet
			%	%
Domestic viscose:				
50 denier	1.46	0.82	17.3	18.8
50 "	1.58	0.86	21.9	23.3
75 "	1.20	0.63	27.3	30.8
75 "	1.38	0.78	27.6	38.3
100 "	1.22	0.60	27.2	33.1
100 "	1.41	0.73	24.4	32.4
150 "	1.27	0.57	24.5	30.3
150 "	1.40	0.64	22.5	28.1
150 "	1.51	0.71	20.1	24.4
170 "	1.55	0.64	24.4	31.4
250 "	1.28	0.55	21.6	25.9
250 "	1.57	0.68	23.9	34.3
300 "	1.18	0.48	23.2	27.0
Foreign viscose:				
100 denier	1.13	0.52	15.7	15.5
100 "	1.20	0.51	18.9	21.3
100 "	1.25	0.77	23.3	29.7
150 "	1.34	0.64	22.2	29.4
200 "	1.31	0.59	19.4	23.5
250 "	1.48	0.65	19.5	23.3
Celta:				
100 denier	1.01	0.44	18.5	16.4
150 "	1.08	0.50	16.9	18.2
Cuprammonium:				
50 denier	1.22	0.65	12.4	12.3
75 "	1.60	0.83	10.0	10.6
75 "	1.50	0.89	10.1	11.9
150 "	1.21	0.51	10.1	8.8
200 "	1.47	0.73	10.1	11.9
Nitrocellulose:				
200 denier	1.27	0.50	15.1	11.8
Cellulose acetate:				
45 denier	1.17	0.74	19.7	...
75 "	1.18	0.65	18.9	...
120 "	1.13	0.65	25.9	30.3
150 "	1.18	0.69	23.8	30.6
190 "	1.20	0.68	25.5	32.9
300 "	1.21	0.67	26.7	35.3
Silk	2.50	2.00	21.0	21.0

meter and is so constructed that it can cope with an elongation running to 25 centimeters. The readings on the dials may be either from 0 to 250 grams or from 0 to 1,000 grams, as desired. The falling speed of the weight may be varied to suit particular circumstances: for the purposes of the tests here recorded the falling speed was 1 foot per minute.

In the case of the regenerated celluloses it was sufficient for the wetting of the fibers to soak them in water at the temperature of the conditioning room—namely, 21°—for half a minute; but this was not enough for the complete wetting of the acetyl rayon, for which the time was extended to fifteen minutes in order that the steeping effect should be carried to the extent required by the tests.

In studying the foregoing table it will be noticed that when silk is wetted the reduction of strength that takes place is 20% of the dry figure; but even in its wet state it is far stronger than the best of the synthetic fibers. Because of this fact the writer holds that it is most unsatisfactory to make continued reference to silk when speaking of the synthetic fibers. Silk is silk, and has its place in the world of textiles based on its own merits. No one thinks of calling silk "imitation cotton" or "near wool," because it has no relation to those fibers. In the same way, rayon has no reference to silk, and the habit of using a name such as "artificial silk" for the purpose of showing up the defects of rayon is to be deprecated. Rayon is no poor relation; it is a very beautiful fiber with many great qualities, and it should therefore be permitted to stand on its own feet.

Taken by and large, the wet tensile strength of the rayon fibers is of the order of 60% of the dry strength of the respective yarns, as will be seen from a consideration of the above table. It is best, in view of the small number of tests made on nitro rayon, to leave it out of the calculation, as the sample there mentioned cannot be regarded as typical of the brand. Just as one may not judge a nation from the idiosyncracies of an individual, so nitro rayon must be studied more extensively before condemning it as the weakest of all the rayons when wetted. The evidence presented is not sufficient to enable us to come to a proper conclusion respecting it.

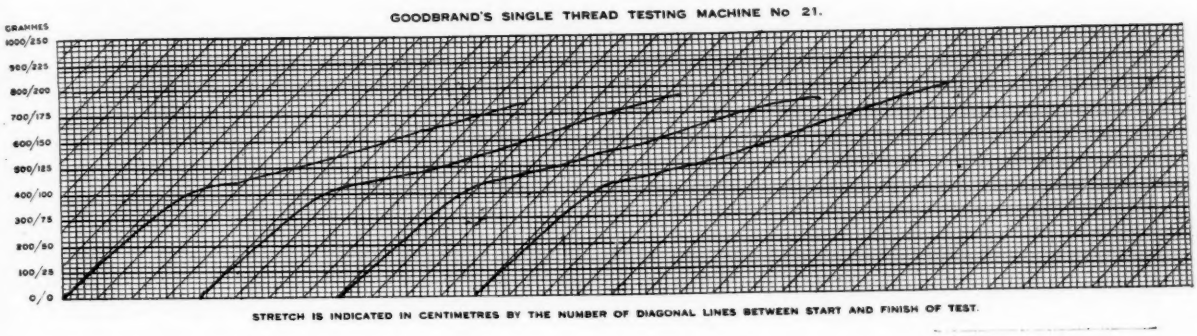
Comparative Rayon Strengths

The wet strength of cellulose acetate rayon is, on the average, higher than that of the other kinds, while its dry strength is lower. This, of course, brings the percentage of decreased strength to a proportionately greater figure than is really justifiable. Obermiller and Goertz, in a table taken from the same source as the preceding one, express the wet strengths of various kinds of rayon in percentages of the dry strengths in figures probably based upon a different set of tests made in their own laboratories. This table is instructive and is given below:

TABLE II

Nitrocellulose	40%
Viscose	55%
Cuprammonium	60%
Cellulose acetate	70%
Silk	80%

A somewhat different but rather more accurate view of the case may be obtained from a consideration of Table III, in which the comparison with the dry



weights is shown after reduction to a common basic number. In column one are shown figures that may be regarded, for this purpose, as being averages of the tensile strengths of dry rayon yarns taken from various sources and including some old and new makes of rayon. Column two shows the relative value of these figures when they have been reduced to proportions of the lowest, here called 100. Column three gives the relative wet strengths calculated from the figures on the percentages of Obermiller and Goertz.

TABLE III

	Average Dry Strength*	Relative Dry Strength	Relative Wet Strength
Nitrocellulose ..	1.27	109	43.6
Viscose	1.35	116	63.8
Cuprammonium .	1.40	121	72.6
Cellulose acetate.	1.16	100	70.0
Silk	2.50	215	172.0

*Grams per denier.

It must be remembered that the column headed "Relative Wet Strength" does not represent a percentage of the dry strength only, but that percentage based upon the relationship of the dry strength toward each other, taking the strength of cellulose acetate as the standard. Once again it is necessary to indicate that caution should be used in accepting the figures for nitro rayon, concerning which in sufficient data are available at the moment, though this is a matter which is receiving attention.

The question of the variation in elongation of rayon yarns under different circumstances may be studied to some extent in a further reference to Table I. It would naturally be expected that wet yarns will show increased lengthening over dry yarns, and the general run of the tests made substantiate that expectation. It may, in fact, be safely predicted of any fiber, except the Cuprate rayon. Cuprate rayon is formed under stretching conditions; the other kinds are not; and this, as Draper and Davis indicated in a paper given in London in 1912, causes a skin to be formed on the yarn which has a different physical relation to the remainder of the filament. In other words, stretch-spun yarns are not entirely homogeneous, and the wetting of the outer coating weakens the thread to such an extent that it is not able any more to withstand the stress-strain to the same extent as those fibers in which the whole substance is in one physical condition.

If reference is made to the record charts that are made during the testing of yarns on the machine described, it will be seen that the elongation of rayon has two distinct phases. During the period at the beginning of the application of the strain the fiber shows distinct resistance to the force until 50% of the weight is on; at that point, with the utmost regularity, the resistance is overcome and the filament stretches rapidly until it breaks. It is in the study of the elongation that these permanent records are of such great value in research.

Reason for Tendering Not Determined

The early resistance of the yarn is due to the elasticity of the cellulosic materials, which is notoriously low; this is regarded as being another of the faults of rayon. It will stretch readily enough when wet and it stays put; it does not regain its natural length on drying, as the weavers discovered very quickly when they began to introduce the fiber into fabrics. Knitters, of course, experienced the same disability and at once it was cried down as being an "impossible" yarn, because an excess of tension in the course of any of the manufacturing processes might lead to the size of thread being reduced by as much as 15%. This showed up at once in the cloth by its variation in luster from that of the remainder, and the effects are known generally in the trade as "shiners."

The real explanation of the tendering of cellulosic materials when they are wetted is yet to be found, though there has never been any doubt that such weakening does take place. As soon as the moisture is removed the original strength is regained and the material is the same before being damped. Even boiling water, though it causes the regenerated cellulose fibers to swell up, does not appear to have any permanent effect, as on drying they return once more to their first condition both of size and tensile strength, always provided that they have

not undergone any sort of stretching while in the wet state; even very slight tension is sufficient to cause an irrevocable weaking. While this is true of Viscose, Cuprate and Nitro rayon, it is not so of the Acetyl Cellulose, for there the action of the boiling water may easily cause the partial destruction of the molecule and breaking down into one or other of the modified forms of cellulose, such as oxy-cellulose, which have neither strength nor luster; for this reason the utmost care should always be taken into the laundering of garments made from the fiber.

It was in dealing with the reduction of strength in rayon that the American manufacturers set an example of philosophical acquiescence to the "god of things as they are" which the whole world has followed. As the mountain of strength could not be brought to the Mahomet of rayon, the manufacturers did the next best thing: they changed all their methods so that no strain was put upon the fiber. They found that the most skilled research workers of all nations have not yet succeeded in their efforts, and it looked as though it would be a long time before things got moving, the manufacturers agreeing that all strains must be kept off if the weakness of the thread was to be overcome. There is no doubt of the complete success of this attitude, for have we not unlimited quantities of the most beautiful fabrics that the ages have ever seen produced from this tender fiber? Instead of treating it, as they treated cotton or wool, the workers at all stages have been taught to regard the yarns as if they were labeled, "Take care; fragile." The improvement brought about by this means has been extraordinary when one calls to mind the very inferior quality of the earlier fabrics as compared with those of the present day from the point of view of irregularity of work and presence of shiners and patches.

Educating the Consumer

The education of the consumer was next taken in hand, and it was some American genius—one can term him no less—who proposed the slogan: Take rayon out of the washtub and put it into the washbowl! It was the obvious cure for the difficulties that women were then experiencing, but it was absolutely contrary to the practice followed by all respectable women, who have been brought up to regard scrubbing and rubbing as being the only true and proper means of doing good work with the laundering. Yet such has been the effect that all over the world the feminine part of the population has developed what may be termed a "rayon sense" which they have in turn succeeded in passing out to the laundries. Every woman now knows that alkaline solutions are wrong for her rayon underwear and stockings, and that they may not be rubbed either in cold or hot water; the garments may be cleansed without that, while such treatment if persisted in would quickly lead to the destruction of the flimsy fabrics.

To have spread abroad this teaching in so rapid a time is an achievement in itself almost as wonderful as the invention of synthetic fibers, and a wise woman said, when discussing the matter quite recently, that if it had been necessary to educate men in the same way, it would have taken a far greater length of time owing to the natural conservatism of the masculine mind. This may be true, though sometimes circumstances force a revision of the old methods, as was the case with the winders, warpers and weavers who make the fabrics.

A great amount of work has been done and much has been written with regard to the sizing of rayon yarns in order to coat them with some material that will give them additional strength and invulnerability. So extensive has been the research that there are really very few substances that have not been tried in one form or another. As sizes for other purposes many of these have distinct merits, but so far as can be ascertained none of them have been of any great value in giving tensile strength.

The best results have come from steeping the yarns in a mixture of oils or greases, and one or two other things that have the effect of waterproofing them. By thus preventing the absorption of water the reduction of strength which results is prevented during those earlier processes when the yarn is being subjected to the most strenuous treatment. It is understood, of course, that the value of sizing as a means of lubricating the yarn in its passage through the machines is not being dealt with here. Before the fabric can be dyed and finished these sizing materials must be removed and the yarn is once more open to attack; the utmost care is necessary in handling in order to preserve it from harm arising from contact with water, its natural enemy.

The most successful of all the various methods that have been brought out for the purpose of dealing with the natural weakness of rayon is the mixing of the filaments with other stronger fibers, and the use of specialized devices in the weaving and knitting whereby the ordinary strains and stresses of wear are thrown upon the natural yarns, leaving to the rayon yarns the duty for which they are far better fitted, namely the imparting of beauty and elegance to the cloth. The spinning of yarns in which rayon filaments are mingled with cotton or wool has given a tremendous impetus to the trade generally, quite apart from that gained from mixed fabrics in which the yarns each retain their own fibers. By skilfully arranged patterns in the looms and knitting machines the whole effect of the rayon has been preserved in cloths which have retained the full advantages of cotton or woolen fabrics. In these ways a fiber which from its inherent weakness might have been considered unsuitable for many purposes has been brought to a position of prominence and value in all branches of the textile industry.

T. C. Beattie has been made superintendent of the recently organized Penn Silk Company, of Dalmatia, Penn.

Investigations on the Action of Oxidizing Agents in Kier Boiling*

Purposes of the Study—The Testing Procedure—Comparative Weight Losses—Action of the Oxidizing Agents—Determining Action of the Oxygen—The Swelling Test

By PROFESSOR DR. HALLER and DR. PAUL SEIDEL
Riehen-Basel

SPECIAL interest in the textile finishing plants has always been given to the bleach, and to-day this is the subject of numerous investigations and discussions. In the investigations to be described the effect of kier boiling on loss of weight and on the obtained degree of bleach, and other improvements in connection with possible observed damages of the fiber noted in determination of its tenacity and of it's oxycellulose contents, have been elucidated and cleared up. Especially those circumstances are to be considered which take place through addition of oxidizing agents to the liquor in the kier during the kier boiling.

Of the oxidizing agents used there were sodium peroxide and sodium perborate, less suitable because of the readiness of their decomposition in the alkaline liquor; while, besides calcium, sodium and magnesium hypochlorite, the "Aktivin" sodium salt of para-toluenchloramide was especially approved. For this reason the publication of the results may be limited only to the application of "Aktivin" in kier boiling.

While desizing, kier boiling and white bleaching are considered fundamental and separate operations, in these investigations a combination of the latter two processes is treated. This is certainly a contradiction of the experiences so far made. When it is considered that the oxygen of the air in the kier is carefully avoided because of its oxidizing and fiber-tendering action, and that this action is avoided by the addition of reducing agents; and when one thinks, furthermore, that the boiling liquor, even such as pure water, has reducing properties because of its contents of cellulose, then it must appear astonishing that, simultaneously with this reducing action, also an oxidizing action should be recommended.

The results of the bleaching method treated in this work, in which the oxidizing agent is immediately added to the liquor in the kier, prove the oxidizing and bleaching action of the added oxygen; which does not, however, attack the fiber and lead to the new opinion that the kier boiling and bleaching process is actually limited to the removing of the hemicellulose, fats and pigments which stay especially in the "cutigula," so that all these processes achieve only the purpose of removing from the cutigula all encrustations, liberating the pure cellulose skeleton.

The textile material used was completely desized gray nettle cloth which no longer gave a starch reaction with iodine and was of uniform quality. The trials were made in small laboratory autoclaves.

The cloth, covered with perforated plates of porcelain, was put into a porcelain dye pot of 1.5 liters, which was put on a large desiccator insert. The pot was kept filled with 1 liter of liquor. Around the outside of the pot water was put into the autoclave.

The Testing Procedure

The filled autoclave was at first heated to 100° C. for twenty minutes, and then intensive steam was led through it in order to remove the air completely from the kettle. Only then was the valve closed and during a further period of twenty minutes heated until 2.5 to 3 atmospheres (37 to 45 pounds) was attained. From that time the kier boiling was done for six hours under the mentioned pressure. The apparatus was allowed to cool in the closed state and then opened.

The pieces of cloth of equal size were dried in the steam drying closet for two hours and, after sufficient cooling, weighed in closed weighing glasses. The average quantity was 40 grams. The sample of cloth was sometimes put into the usual liquid for better wetting out, and then brought into the kier as mentioned. After boiling, the cloth was washed out in 1 liter of distilled water and this washing water was then filled up to exactly 2 liters with the kier boiling liquors. The cloth was left during the night in another 2 liters of distilled water, so that the alkali absorbed by the cloth was extracted as completely as possible.

The kier boiling liquors, all washing waters and the water which was put into the autoclave outside of the color cup—the latter possibly containing alkali which had perhaps foamed over—were then titrated with n/2 sul-

*Note of the translator: This work was published in Volume 25 of the "Zeitschrift fur angewandte Chemie," 1928 (Germany). Its contents are so interesting and new that they will have considerable attention from textile men. Isn't it strange to add oxidizing agents into the kier? We learn from this work that kier boiling, such an old standard method, can be improved by modern chemistry. Therefore, I hope it is a grateful work to have translated this publication in its entirety. The author, Professor Dr. Haller, is very well known in Europe as an inventor and authority on printing, and as a man of keen and modern ideas.—Dr. Richard Feibelmann.

phuric acid for determination of the alkali. Likewise, the organic substances dissolved in the liquor, and for a smaller part in washing water, were ascertained by determination of their consumption of permanganate (oxygen). (1 c.c. n/10 $KMnO_4$ = 0.0008 gram oxygen.)

The rinsed cloth was then acidified with 100 c.c. n/1 hydrochloric acid, which was diluted to 1,500 c.c. for twenty minutes and immediately rinsed until litmus paper put into the cloth no longer gave an acid reaction. The cloth was centrifuged, dried two hours in the steam drying closets, and, in the same manner as before, the loss of weight was determined by weighing in the closed weighing glass.

In a first trial the kier boiling liquor had a concentration of 3° Bé. caustic soda, and this concentration corresponds to the proportion used in practice and is equal to the contents of 20 grams caustic soda in 1 liter (= 2%). All latter trials with Aktivin were based on the same concentration.

The blowing away of the air was omitted in the trials in which air was present, and the valve was closed from the beginning.

In the steaming trials the cloth was impregnated overnight in 3° Bé. caustic soda and, after the chief quantity of liquor was permitted to drain off, was put into the kettle. These trials served especially for the determination of oxycellulose production and are mentioned here only for the sake of completeness.

For the trial with lime, a milk of lime was made by slacking of quicklime. A quantity of 5 grams of slacked lime, determined by titration and diluted to 1 liter, was used as kier boiling liquor.

A further trial serves for the discussion of the changes which take place in caustic soda kier boiling of a cloth that has first been kier boiled with lime.

Finally, the cloth was boiled out with caustic soda without pressure and, furthermore, with the addition of Aktivin (5% of weight of the goods), likewise without pressure.

In this table the boiling with caustic soda shows a greater loss of weight than with lime. This is explained by the fact that lime acts on the impurities of cotton chiefly through changing rather than dissolving.

Comparative Weight Losses

The slightly greater loss of weight in the presence of air oxygen can most probably be explained by the action of small amounts of air dissolved in the liquor. But the great loss of weight in the steam trials—especially with air—is due to a considerable attack on the cloth.

The kier boiling with caustic soda after lime results in a further loss of weight of more than 6%, which relates to the removal of large quantities of impurities.

The loss of weight in boiling without pressure remains less than with pressure, which does not require further explanation. By the following trials it is shown that the addition of Aktivin results in an increased loss of weight, and therefore an increased dissolution of the impurities.

The loss of alkali and the contents of organic substance are parallel to the loss of weight. The loss of weight of the cloth and the relative contents of organic substance of the solution must be complementary.*

The values quoted as figures of comparison correspond to the consumption of alkali—i. e., to the contents of organic substance calculated for 100 grams weight of goods.

The further trials concern the investigation of the circumstances which occur when, the contents of alkali being constant (20 grams per liter), the oxidizing agent is added in increasing quantities.

Aktivin was used as oxidizing agent, starting with the addition of 2% based on the weight of cloth. The content of available chlorine was fixed at 20% by titration. The addition of 2 per thousand corresponds, therefore, to an addition of 0.4 per thousand available chlorine.

The choice of this starting concentration was determined by conditions of the kier boiling with Aktivin, which one of us (Haller) had introduced successfully in practice.

We then increased the additions in progressions of 2 per thousand Aktivin and 0.4 per thousand available chlorine, respectively, until 10 per thousand Aktivin and 2 per thousand available chlorine, respectively, and finished our trials with the addition of 50 per thousand Ak-

*If the encrustations are not decomposed into carbon dioxide and water.

TABLE I

KIND OF KIER BOILING Six hours at 2.5–3 atmospheres (37–45) pounds).	Loss of Weight %	Consumption of Alkali %	Comparative Figure %	Organic Substance Grams O_2	Comparative Figure Grams O_2
NaOH 3° Bé. deaerated	5.15	14.43	32.48	1.19	3.67
NaOH 3° Bé. not deaerated	5.28	14.55	34.00	1.35	4.00
NaOH, steamed, deaerated	6.03	....	....	1.38	3.71
NaOH, steamed, not deaerated	8.34	....	....	1.54	4.69
Lime, 5 g/l deaerated	3.90	23.40	56.50	1.07	3.02
Lime, 5 g/l and NaOH 3° Bé.	2.25	16.79	40.24	1.37	3.44
NaOH 3° Bé. without pressure	4.14	24.80	63.11	1.28	3.46
NaOH 3° Bé. without pressure with Aktivin (10 per thousand available chlorine)	4.35	23.60	63.87	1.66	4.23

tivin and 10 per thousand available chlorine, respectively.

Table II demonstrates the action of Aktivin.

TABLE II

Kier Boiling with Caustic Soda and Aktivin

Addition of Aktivin	Available Chlorine Per Cent	Loss of Weight, Per Cent	Consumption of Alkali, Per Cent	Comparative Figure, Per Cent	Organic Substance Grams O_2	Comparative Figure, Grams O_2
2.0	0.4	6.23	15.6	30.03	1.34	3.65
4.0	0.8	6.28	16.4	32.43	1.38	3.84
6.0	1.2	6.32	16.8	33.58	1.62	3.93
8.0	1.6	6.35	17.2	36.04	1.82	4.58
10.0	2.0	6.37	17.6	37.40	1.83	4.85
50.0	10.0	7.53	18.9	47.30	3.32	7.85

The results demonstrated an increase in the loss of weight with the increase of the addition, which is especially evident in the trial with the highest addition (70 per thousand available chlorine).

The consumption of alkali and the contents of organic substance of the kier boiling liquor go remarkably parallel with the loss of weight also here, and both increase with the amount of Aktivin.

Action of the Oxidizing Agents

The cause of these phenomena is to be found in the fact that the oxidizing agent acts chiefly through decompositions of the impurities of the fiber. One can especially imagine that the impurities are changed into compounds soluble in alkali by the oxidizing action of the additions—in greater amounts than can be attained by the alkaline liquor alone.

The objection that the oxidizing agents do not act with the cloth but with the incrust dissolved in the liquor appears erroneous, because then the contents of organic substance in the liquor should decrease witth the increasing additions. But this does not correspond to the stated facts. The following trial on a large scale elucidates this better. Furthermore, the later described bleaching action of Aktivin demonstrates that the additions act not only with the dissolved substances but also with the cloth.

A good completion to the above-described series of experiments is a trial that has been conducted in the calico printing work of Jentzsch Bros. in Grossenhain with a kier boiling in the practice.

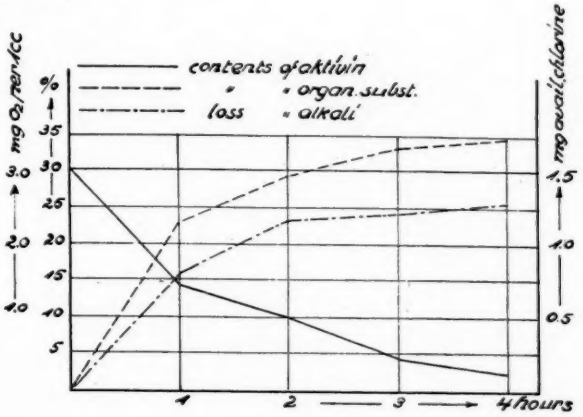
The kier was equipped with a cock near the gauge glass so that at certain intervals during the kier boiling samples of the liquor could be taken; this was done at the start of boiling and at intervals of one hour to the end of four hours' boiling.

The samples were at first tested for their content of Aktivin and the relative amount of available chlorine. The titrations executed with 10 c.c. gave the following values:

	Consumed C.C. of n/50 — $Na_2S_2O_3$		Milligrams of Available Chlorine
At the start	2.20	=	1.562
After one hour	1.00	=	0.710
After two hours	0.75	=	0.533
After three hours	0.30	=	0.213
After four hours	0.15	=	0.107

The trial tests with Aktivin, though at an excess atmospheric pressure of 1.5 (22 pounds) and at the corresponding temperature, show that the product is very stable, so that even after four hours' boiling traces of Aktivin are still detectable.

Furthermore, the tapped samples of the liquor were titrated for determination of their contents of organic substance.



Every 10 c.c. of the liquor consumed:

	n/2H_2SO_4 C.C.		% Decrease of Alkali
At the start	5.10	=	0.00
After one hour	4.25	=	16.70
After two hours	3.90	=	23.53
After three hours	3.85	=	24.51
After four hours	3.80	=	25.49

The organic substances dissolved in the liquor consumed per 1 c.c.:

	n/10 $KMnO_4$ C.C.		Milligram O_2
At the start	0.00	=	0.000
After one hour	2.91	=	2.328
After two hours	3.70	=	2.960
After three hours	4.15	=	3.320
After four hours	4.28	=	3.424

The conclusion from these titrations is that the process of kier boiling is properly finished after the second hour. The longer boiling in practice attains only a thorough and uniform finishing of the boiling. The experiments demonstrated that here also the consumption of alkali is parallel to the dissolving of the impurities. (See diagram.)

The further decomposition of Aktivin after the second hour—after which the kier boiling can be considered as finished—permits the conclusion that Aktivin then begins its bleaching action.

For the question whether or not the fiber is eventually attacked by the formation of oxycellulose, the tenacity of the cloth was examined by the dynamometer of Schopper, and that part of the cloth which was converted into oxycellulose in the single trials was determined by the copper-and-permanganate method.

The determination of the copper number, the method of Schwalbe, modified by Braid,* was used.

In following Kauffman's permanganate method † we did not fix the "fundamental value" by more than one boiling. The consumption of permanganate was determined by a single boiling of 1 gram of the cloth. For this reason the thus obtained number—in order to avoid confusion—is not called "permanganate number," but "boiling number." Table III demonstrates that a single boiling is quite sufficient for obtaining comparable values.

TABLE III

Kind of Kier Boiling	Wgt. in Kilograms Warp	Filling	Comparative Figures Warp	Filling	Copper Number	Boiling Number
Gray goods I	23.06	15.53	100.00	100.00	0.307	18.70
Gray goods II	27.88	25.11	100.00	100.00	....	....
Gray goods III	28.75	15.66	100.00	100.00	....	....
NaOH 3° Bé. deaerated	23.20	16.75	100.60	106.00	0.063	2.50
The same, not deaerated	27.73	15.43	96.45	98.53	0.100	2.75
NaOH, steamed, deaerated	23.63	13.03	82.19	83.21	0.100	2.90
The same, not deaerated	6.91	5.96	24.03	38.08	0.200	8.50
Lime 5 g/l deaerated	28.41	15.80	98.82	98.60	0.100	2.75
Lime 5 g/l and NaOH 3° Bé	26.79	16.50	93.18	105.30	0.063	2.50
NaOH 3° Bé, without pressure	27.19	18.04	94.54	115.20	0.138	3.75
The same and Aktivin (10 per thousand available chlorine)	27.55	17.78	95.83	113.90	0.138	3.75

TABLE IV

Kier Boiling with Caustic Soda and Aktivin

Addition of Aktivin*	Weight in —Kilograms— Warp	Filling	Comparative ——Figures—— Warp	Filling	Copper No.	Boiling No.
0.4	23.11	16.70	100.20	105.70	0.100	2.38
0.8	24.63	16.60	106.80	105.10	0.100	2.75
1.2	24.47	16.25	106.20	102.80	0.100	2.75
1.6	23.80	19.95	103.20	107.30	0.080	2.38
2.0	23.77	16.00	103.10	101.20	0.080	2.38
10.5	23.81	17.11	103.20	108.30	0.075	2.50

*In per thousand of available chlorine.

The treatment with caustic soda in a concentration of 3° Bé. (2%) under pressure occasions no injury to the cloth, since a material free from oxycellulose results, the firmness of which is not at all diminished. In the following trial the air, which had remained in the kettle and therefore in small amounts also in the liquor, led to the formation of a little oxycellulose, as is shown by the increased copper and boiling numbers and by the slight decrease of the tenacity.

Determining the Action of Oxygen

To determine how larger amounts of air oxygen might act on the fiber, samples of the cloth impregnated with liquor were steamed in the absence and presence of air. Air oxygen caused a considerable amount of oxycellulose, as is shown by the tenacity, decreased in an amount of about 75% and by the increased copper and boiling numbers. This trial confirms the experience of the practice as to the damages caused by air. But this attacking will occur only when the goods project in an air space, or when in the material itself greater amounts of air are enclosed in larger folds; also in this case the material in a certain degree projects in an air space.

A boiling with caustic lime, followed by boiling with caustic soda, leads to a loss of tensile strength of the material, although relatively small, which is caused by the double treatment of the material under pressure and the consequent weakening of the cloth.

The determined loss of strength in kier boiling with caustic soda in the open kier is rather an experimental error. (The filling of the same cloth shows in this case an even greater gain in strength), as the various figures are due to the irregularity of the cloth and the insufficient data, as only ten separate trials were made. The comparative values derived by multiplication of the observed values show, therefore, a variation in an even higher degree. The observed higher values of the copper and boiling-off indexes are explained like the high indexes of the raw material, through the two methods used in those cases; the one simultaneously determined the reducing ability of the impurities, in the other these impurities were dissolved from the cloth and thus caused the higher permanganate index.

*Melliand Textilberichte 1925, 663.
†Melliand Textilberichte 1923, 333, 385.
For getting comparable figures, the weight necessary for bearing the gray cloth was called 100 and the figures obtained in the trials were converted relatively.

Considering the above as to the various indexes, the figures in Table IV lead to the unquestioned statement that additions of Aktivin, even of the highest amounts of 10 per thousand of available chlorine, do not tender the cloth. The figures are all over 100, and indicate thus an increase of the tensile strength. Therefore, the question of damage by formation of oxycellulose does not enter. (Refer to the copper and boiling-off indexes.)

The reason for the safe use of Aktivin additions to NaOH kier boiling lye is found, in our opinion, in its slow liberation of oxygen in the strong caustic liquor, as the presence of the hydroxide ions has a retarding effect on the decomposition of this bleaching agent.

Study of the Degree of Whiteness

The further investigations pertained to the determination of the degree of whiteness of the kier boiled samples. (For that purpose we had the photometer of Pulfrich.*)

If we consider at first the degree of whiteness of the boiled samples, we see that boiling with caustic lime is insufficient. Lime tends rather to make the material yellow, which is proven by practical experiments. Much better results are obtained with caustic sodium. The highest degrees of whiteness are shown by those cloths treated at first with caustic lime and then boiled with caustic soda. The caustic soda boiling, even without pressure, gives a better white, which is improved by the addition of Aktivin (10 per thousand available chlorine). A complete removal of the motes is not possible by either open boiling or boiling under pressure with caustic lime, as is the case of pressure boiling with caustic soda.

TABLE V

Kind of Kier Boiling	Degree of Whiteness
Raw cloth	43.0
Caustic soda	50.2
Caustic lime	40.1
Caustic lime plus caustic soda	62.0
Caustic soda without pressure	48.0
Caustic soda without pressure and Aktivin	52.5

TABLE VI

Aktivin Addition in per Thousand Available Chlorine	Degree of Whiteness
0.4	55.0
0.8	56.4
1.2	57.0
1.6	59.0
2.0	62.0
10.0	62.1

Table VI shows the action of the Aktivin additions, proving that with higher additions of Aktivin a higher degree of whiteness is caused. The bleaching effect of Aktivin, as well as the course of its action on the goods itself, is therefore proven. The maximum seems to be reached by the addition of 2 per thousand available chlorine, as the increase of the whiteness is beyond comparison to the five times greater quantity of Aktivin.

Valuable information as to how and to what degree the pectin substances—i. e., impurities of the cotton cellulose—were removed by the different treatments was obtained by microscopic examination of individual cotton fibers.

The different treated fibers were, for that purpose, tinted evenly with a weak acetic acid solution of safranine. While the raw fiber showed, owing to the pectinous substances, numerous red motes, the fibers treated with caustic lime and caustic soda, respectively, show them to a lesser degree or not at all.

The same picture was obtained when material in question was first treated with copper sulphate solution after treatment with a solution of potassium ferro-cyanate. The reddish-brown complex compound of Cu_2FeCy_6 was formed on the raw cloth only where the pectinous substances were. Both boilings removed the pectines rather completely.

Swelling Test

For further determining the change of the cotton fiber by the boilings the characteristic phenomenon of swelling of the fiber by copper oxide ammonia was resorted to.

The swelling of the cellulose in raw cotton is hindered by imbedded larger amounts of cutinous particles in the cutigula, so that characteristic constrictions between these barrel-like swellings are formed. If we treat a caustic lime or soda-boiled material in the same manner, these phenomena do not occur to such a marked degree. The encrusted substances are mostly removed from the cutigula by kier boiling with lime or caustic soda, converting the cutigula into cellulose to a more or less degree.

Its resistance to copper oxide ammonia is lost. It swells evenly, like ordinary cellulose, and gives traces of constrictions.

Conclusions for the Bleaching Process

1. Contrary to the former opinions, the addition of suitable oxidizing agents is absolutely an advantage. The most suitable is Aktivin on account of its natural cleavage products, which are easily soluble and removed. Compared with the old method of kier boiling, the degree of whiteness so obtained is a higher one without any injury to the fiber.

2. The kinds of oxidizing agents used are not material; those which lose oxygen rapidly in alkaline medium must be avoided.

3. The kier boiling with the addition of Aktivin may be performed advantageously at lower pressure than usual, since the oxidizing action is prolonged over a longer time.

4. The time of kier boiling can be reduced, since boiling for not longer than four hours gives the same if not better results than the standard kier boiling of six to eight hours.

5. The chlorination can be performed with much more diluted solutions of hypochlorite when using the oxidizing kier boiling, which considerably diminishes the danger of injury to the fiber.

*Zeitschrift f. Instrumentenkunde 1925, 35, 61, 109, 521.

Some New Problems in Dyeing of Ribbons

The Problem of Fiber Combinations—Boiling and Degumming—Increasing Absorptivity of Cotton

By George Rice

THE increased use of lingerie and shoulder ribbons in almost unlimited qualities and colors has created some new problems for dyers. These ribbons are dyed in various shades of pink, blue, Nile, pongee, maize, peach and black; all vidid, washfast and beautiful. Some are imported and some are the product of the domestic manufacturers.

They are appearing in the different herringbone, ribbed, satin, diamond, plain, twill and crepe weaves, some with corded edges and some with plain edges. The bulk of the ribbon product is dyed in the woven state, hence the nature of the weave texture is of more or less concern to the man who is required to get a level and fast color regardless of the interlacing of the yarns and the raw materials of which they are composed. The lingerie ribbons also include those of the shirred class, with fancy edges, in colors of lavender, coral, honeydew and flesh. Some of these ribbons are used in garters and girdlons.

Consequently instead of having only the ordinary hat ribbons and silk bias fold tapes to color as in times gone by, we have a cluster of ribbon material which is attractive in quality and design as a rule, but which apparently is testing the ability and patience of some dyers to properly color. Formerly most of the dyeing was done in the loose stock and the dyer knew just what he was coloring. Mulberry silk and cotton constituted the raw material for ribbons. The greater portion of the modish styles of American and French ribbons are first woven and then dyed. Just what is the composition of the yarns in these dainty ribbons often is puzzling. They are all called silk or rayon, even if cotton is used in liberal quantities in the yarns.

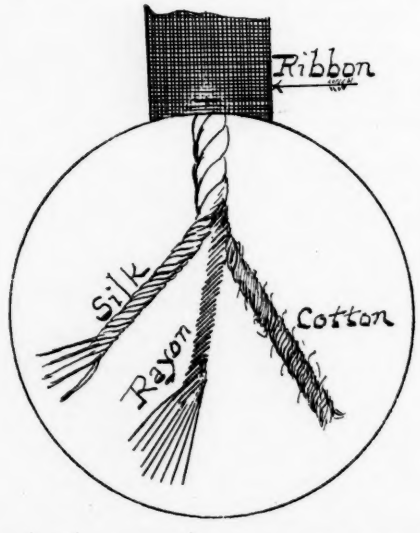


Fig. 1—*Some ribbons are woven with doubled and twisted yarns containing three kinds of stock.*

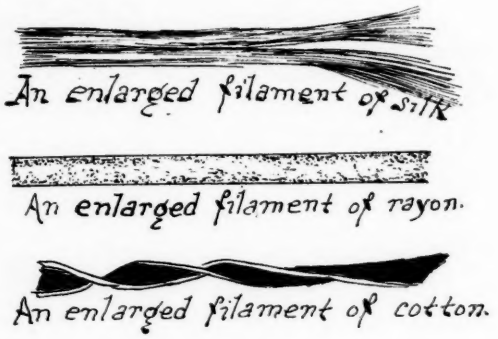


Fig. 2

Some of the ribbons are woven with double and twisted yarns containing three kinds of stock, such as silk, rayon and cotton as shown in Fig. 1. The silk end is made up of a number of filaments of viscose which were drawn and united in the chemical and mechanical process of making an artificial substance. Hence its dye affinity and dye retaining properties are different from that of the worm silk end which must be simultaneously colored. The cotton end usually is made thick enough to travel singly and therefore is not composed of a number of separate strands. Thus the three ends, each made up of a different raw material, are combined into one and compose the warp threads in a closely textured ribbon The dyer of a ribbon mill has the advantage of knowing the composition of the ribbons he colors. Other dyers have to make an analysis to determine if the ribbons are natural silk, rayon or a combination of both, or a mixture of these two silks with cotton. Owing to the skill in which various substances other than true silk are manufactured into ribbons, the matter of ascertaining just what other stock has been used is not an easy task.

An enlarged filament of silk which represents a species of textile material capable of readily taking up dye is shown in Fig. 2. Alongside of it is a similarly enlarged filament of rayon, which is also easily dyed, but under somewhat different conditions from those of silk, yet the two filaments must be colored at the same time when woven together in the same ribbon.

An enlarged filament of cotton is also shown. Its physical structure and chemical composition differs from both the mulberry silk and the rayon fiber, yet it must be efficiently dyed in the ribbon.

Boiling to Degum the Silk

Assuming that the ribbons contain silk, rayon and cotton, they must be put through the degumming operation to get the gummy substances out of the silk with a soap solution of about 25% of the weight of the ribbons. An

(*Concluded on page* 100)

Proceedings of the American Association of Textile Chemists and Colorists

The American Association of Textile Chemists and Colorists

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John V. Killheffer, Chairman; Earl W. McLean, Secretary.

FIFTY-SIXTH COUNCIL MEETING

THE Fifty-sixth Council Meeting was held at the Engineers' Club, Boston, Mass., at 2 o'clock Friday afternoon, January 18.

The following officers and councilors were present: E. H. Killheffer, G. A. Moran, Hugh Christison, L. A. Olney, W. H. Cady, Walter C. Durfee (representing Winthrop C. Durfee) and Alex. Morrison.

The reading of the Secretary's report of the last Council meeting was waived, as it was published in Proceedings printed December 24, 1928.

The Treasurer's report was read and accepted.

The following applicants were elected to membership:

Active Members

Betsch, George, boss dyer, Superior Piece Dye Works, Long Island City, N. Y.; 504 Summit Avenue, Fort Lee, N. J.

Ginter, Karl, superintendent dyeing, Industrial Dyeing Corporation of North Carolina, 204 West Worthington Avenue, Charlotte, N. C.

Green, James, colorist, Apponaug Company, Box 425, Apponaug, R. I.

Knoepfel, Walter, superintendent, Weil-Kalter Manufacturing Company, St. Louis, Mo.; 504 South St. Louis Street, Sparta, Ill.

Ludwig, Henry L., color chemist, R. H. Schleicher & Co., Inc., 147 Spring Street, New York, N. Y.

Tattersall, Fred, superintendent of printing, U. S. Finishing Company, Pawtucket, R. I.; 260 Medway Street, Providence, R. I.

Junior Members

Black, James W., student, North Carolina State College, Raleigh, N. C.

Carbone, Alfred J., student, Lowell Textile Institute; 10 Columbia Park, Haverhill, Mass.

Hopwood, James A., dyer, Bradford Dyeing Association, Bradford, R. I.; 60 William Street, Westerly, R. I.

Herschburg, Henry P., assistant manager, Imperial Printing & Finishing Company, Belleporte, R. I.; 227 Armington Street, Edgewood, R. I.

Westbrooke, Clayton C., student, Lowell Textile Institute; 48 Milton Street, North Andover, Mass.

Corporate Member

Troy Blanket Mills, Troy, N. H.; Edgar H. Barker, construction engineer, Lowell Textile Institute, Lowell, Mass., representative.

Several applications were turned back to the Secretary for further information in regard to qualifications.

The question of combining some of the duties of Secretary and Treasurer was next opened for discussion. It was finally voted that—

"Beginning March 1, 1929, all membership dues and contributions be collected by the Secretary and turned over to the Treasurer, and all correspondence pertinent to the above be handled by the Secretary, the details of carrying out this arrangement to be left with the committee on correlation of Secretary's and Treasurer's work."

This committee is Messrs. H. Christison, H. W. Leitch and W. S. Williams.

A letter from the Philadelphia Section, principally in regard to the Annual Meeting, was read and discussed.

It was voted that the next Annual Meeting be held in Philadelphia, Pa., and a tentative date was set as December 6 and 7, 1929.

In connection with the Annual Meeting it was voted that—

"The Association will collect the registration fees, and if the general annual meeting committee has a deficit the moneys collected as registration fees can be drawn upon to defray this deficit."

It was voted that—

"The President should write the Philadelphia Section advising them of the above two votes and of a few ideas of the Council pertaining to general program connected with our annual gathering."

Geographic Limits of Sections

The matter of geographical location of the several Sections was brought up in the letter from Philadelphia, and it was voted to again publish these locations, and they are given below, with the dates of Council meetings at which they were set up:

Rhode Island Section; November 18, 1921; State of Rhode Island.

Northern New England; December 9, 1921; all New England except Rhode Island.

New York Section; January 13, 1922; New York State and northern New Jersey (north of territory given Philadelphia Section).

Philadelphia Section; June 9, 1922; entire State of Pennsylvania and New Jersey south of line including city of Trenton east to Atlantic Ocean and the entire States of Maryland and Delaware.

Southern Section; September 26, 1924; south of Potomac River and east of Mississippi. Later split:

Piedmont Section; December 3, 1926; Virginia, North Carolina and South Carolina.

South Central Section; December 3, 1926; area west of Appalachian Mountains.

A letter to the President from the Atlas Electric Devices Company in regard to certain details pertaining to the Launder-Ometer contract was read and discussed, and it was voted that—

"The President be empowered to take up the changes with the Atlas Electric Devices Company and proceed to get the contract into shape satisfactory to both parties."

The committee on incorporation of the Association reported considerable progress, having decided on Massachusetts as the State in which to incorporate, and were instructed—

"To proceed to incorporate and have papers ready for official signatures at the next Council meeting."

Co-operation for Research

The President opened for short discussion the matter of a Research Bureau, which has been before the Association as a whole more or less. One of the preliminary steps is to have our Association get together with other manufacturing and textile societies or associations, and to study the matter with an idea of co-operation or co-ordination, and with this in mind it was voted that—

"The President appoint a committee of twenty-four, a majority of whom are members of our Association, to study this matter of a Research Bureau."

It was voted that—

"Professor Olney be appointed Chairman of Year Book Committee, with power to select his own committee."

It was voted that—

"The President be authorized to appoint a program committee for the next annual meeting, the President to serve ex-officio."

The matter of expense account of officers was discussed, but no definite action was taken.

It was voted that—

"The tentative date and place of the next Council meeting be March 8, 1929, in New York City."

The meeting adjourned about 4:30 p. m.

Alex. Morrison, *Secretary*.

FIFTY-FIRST RESEARCH COMMITTEE MEETING

THE fifty-first Research Committee meeting was held at the Engineers' Club, Boston, Mass., at 4.30 Friday afternoon, January 18.

The following members were present: Chairman L. A. Olney, E. H. Killheffer, W. H. Cady, W. E. Hadley, G. A. Moran, Walter C. Durfee, Wm. K. Robbins, H. Christison, R. W. Hook, Hans Meyer, R. E. Rose, Jos. F. X. Harold, Wm. C. Smith and Alex. Morrison.

Regrets on inability to attend this meeting were received from several of the members.

Chairman Olney asked for the attitude of the members of the committee in regard to the Year Book and certain phases of its contents, expressing a few ideas he had on some new features. It might be inserted here that the Council so greatly approves of these matters that they made Professor Olney Chairman of the Year Book Committee with power to select his own committee.

The Chairman reported progress on the translation of the German Fastness Tests on Rayon, and these will be published in the near future.

The matter of a special questionnaire to be sent to each member of the association relating to the work of the Research Committee was discussed. It was thought that such a questionnaire would not only be of assistance to the Research Committee in formulating its program, but in addition would be of assistance to the sub-committee that is to make a survey of the textile industry as a whole, in search of vital problems which should be investigated and studied. The sending out of such a questionnaire was left in the hands of the Chairman of the Research Committee and the Secretary.

It was suggested and voted that the various sub-committees of the Research Committee be compiled and published.

New Sub-committees

The appointment of new sub-committees was next taken up and the following were appointed:

Sub-committee on Research Survey of Textile Industry: Wm. D. Appel, Chairman, Prof. Elmer C. Bertolet, Dr. Harold C. Chapin, Russel W. Hook.

Sub-committee on Rubberized Textiles: Dr. Raphael E. Rupp, Chairman, Dr. Robert E. Rose, F. R. McGowan, Clarence L. Nutting.

The committee is to request the rubber industry to appoint a similar committee, and the two work jointly in an endeavor to bring about a co-operation of the textile manufacturers and the vulcanizers and to obtain a better understanding of the limits of impurities allowable in textile fabrics to be rubberized and to work out and definitely establish methods of procedure to determine these impurities.

Sub-committee on Waterproof Tests: Dr. Jos. F. X. Harold, Chairman, Ephraim Freedman.

The work of this committee will consist in investigating different procedures to determine the ability of resistance to water of waterproofed fabrics. The matter was originally brought forth by correspondence that had been received from Mr. Freedman. Dr. Harold was asked to consult with Mr. Freedman and the two report at the next committee meeting. The chairman was authorized to enlarge this committee at his discretion.

Sub-committee on Bibliography of Textile Chemistry: Prof. Chas. E. Mullin, Chairman, Howard S. Neiman, John H. Skinkle, Carl Toepler, Wm. C. Smith.

It is the intention of the Research Committee to have this bibliography incorporated into the next Year Book.

William C. Smith, our research assistant at the Bureau of Standards, reported progress on the Light Fastness Report Series IV, which ought to be ready for publication in about a month.

Mr. Cady reported continuation of work on establishing light fastness standards on all fibers.

A few moments were devoted to an informal discussion of tests in the Launder-Ometer.

The meeting adjourned about 6 p. m. with the understanding that the next meeting will be at the time of the next Council meeting, which has tentatively been set at March 8, 1929, in New York City.

Alex. Morrison, *Secretary.*

JANUARY MEETING OF THE RHODE ISLAND SECTION

THE January meeting of the Rhode Island Section was held on Friday evening, January 18, in the rooms of the Providence Engineering Society.

Albro N. Dana presided, due to the absence of Mr. Hutton.

The following officers were elected for the year 1929: Richard B. Earle, chairman; A. Newton Graves, secretary; Ben Verity, treasurer.

Sectional Committee—John G. Masson, Carl R. Moore, Morrell Mackenzie, Herbert F. Schwartz.

The Nominating Committee consisted of the following: Allison R. Fletcher, Alfred L. Lustig, Morrell Mackenzie.

Dr. Berthold Wuth, chief chemist of the Ciba Company, gave an interesting talk on the subject, "Optical Heterogenity and Its Relation to Fastness of Vat Dyeings." This will be published later.

The speaker was given a rising vote of thanks by the thirty-two members present.

A. Newton Graves, *Secretary.*

PIEDMONT SECTION HOLDS QUARTERLY MEETING

THE Piedmont Section held its regular quarterly meeting on Saturday evening, January 19, at Greensboro, N. C., in the Hylmore Dining Room, Jefferson-Standard Life Building. Dinner was served to members and their guests at 6:30 p. m. and the meeting was called to order shortly after.

According to a preliminary announcement of the meeting, Dr. W. W. Bray, director of research for the Procter & Gamble Company, spoke on "Soap and Its Uses in the Textile Industry." Prof. A. H. Grimshaw, of North Carolina State College, gave a talk on starches.

Thomas A. Marlowe, Southern manager of Sonneborn & Sons Company, led the discussion upon Dr. Bray's paper; Cameron McRae, Southern manager of the Arabol Manufacturing Company, and Fred C. La Piana, chemist for Stein, Hall & Co., led the discussion on Professor Grimshaw's address. Harold M. Chase, chief chemist and superintendent of the Riverside and Dan River Cotton Mills, opened the discussion on "Dyeing in Closed Machines," and Mr. McGinty, of the knitting department, Wiscassett Mills, was requested to lead the discussion on "Hosiery Dyeing and Finishing."

A full report of this winter meeting, with the papers delivered, and discussions will be published in an early issue of the Proceedings.

Applicants for Membership

Active Membership

Apsey, Jr., George W., chemist, Jacques Wolf & Co., Passaic, N. J. Sponsors: George Wolstenholme and Daniel Knowland.

Bishop, Claude E., salesman, Chemical & Dye Corporation, Greensboro, N. C. Sponsors: H. A. Barnes and Thomas Nuckolls.

Cleaveland, Normand C., salesman, Cowles Detergent Company, Cranston, R. I. Sponsors: A. N. Graves and A. R. Fletcher.

Chapman, Thomas H., salesman, John Campbell & Co., 75 Hudson Street, New York, N. Y. Sponsors: George C. Lommel and D. L. Clarenbach.

Dunlap, Earl S., colorist, Clifton Yarn Mills, Conshohocken, Pa. Sponsors: Charles A. Seibert and Harry G. Fish.

Heckman, Raymond C., foreman-dyer, E. Richard Meinig Company, Reading, Pa. Sponsors: Theodore Z. Kramer and Karl Krug.

Gensheimer, Joseph M., salesman, General Dyestuff Corporation, New York, N. Y. Sponsors: H. E. Hager and G. H. Alpers.

Lockhart, George R., manager, Woonsocket Rayon Company, Woonsocket, R. I. Sponsors: Ralph F. Culver and B. Wuth.

Seltzer, William, chemist, Jacques Wolf & Co., Passaic, N. J. Sponsors: George Wolstenholme and Daniel Knowland.

Junior Membership

Golden, Andrew C., student, Bradford Durfee Textile School, Fall River, Mass. Sponsors: James Worton and C. Nelson Alderman.

Stewart, John W., student, Lowell Textile Institute, Lowell, Mass. Sponsors: L. A. Olney and John H. Skinkle.

Changes of Address

Appeltofft, Ossian, General Dyestuff Corporation, 159 High Street, Boston, Mass.

Ashbrook, D. S., Bradford Dyeing Association, Bradford, R. I.

Baxter, George L., 116 Halstead Avenue, Mamaroneck, N. Y.

Bell, Edward B., 8633 Eighty-ninth Street, Woodhaven, L. I., N. Y.

Bower, E. F., 568 Fairthorn Avenue, Philadelphia, Pa.

Credo, Chas. F., Broad and Spring Garden Streets, Philadelphia, Pa.

Cullen, Matthew A., 27 Pawnee Parkway, Buffalo, N. Y.

Dick, Carroll S., 160 W. Windsor Street, Reading, Pa.

Emerson, Robert M., care of Holzhausen, 268 King St., Westport, Conn.

Knaeble, Eugene C., Broad and Spring Garden Streets, Philadelphia, Pa.

Kuhl, Herbert, 1026 Industrial Trust Bldg., Providence, R. I.

Putnam, Leverett N., Webster Mills, Webster, Mass.

Schoen, Andre, 146 Prospect Avenue, Hackensack, N. J.

Schoffstall, Charles W., 821 Forest Avenue, Evanston, Ill.

Scott, L. C., 1745 Caton Avenue, Brooklyn, N. Y.

Sheffield, Isham V., 109 Cave Spring Street, Cedartown, Ga.

Torsdale, O. H., 7 Spring Street, Exeter, N. H.

Practical Hints on the Production of Bright Colors on Textile Fabrics

Part XLII

Stripe Effects in Printing—The Plant Employed—The Cottage Steamer—A Chain-Driving Machine—Various Special Patterns

By RAFFAELE SANSONE

STRIPES are another field of wide exploitation for the calico printer, and it has been possible to launch on the market many new and attractive effects, varying with the fashion—the consuming public preferring at one time the simplest creations, and at another time those of most bizarre design.

Thus the print shown in Fig. 1 found a certain favor some time ago. This contains very dark-colored or black stripes not showing the texture, medium-colored stripes revealing the texture, dark stripes produced with diagonal lines, and medium-colored stripes also produced with diagonals. White horizontal stripes give a greater demarcation to the effect. By changing the colors and thickness of the stripes unlimited variety was possible, and the same result was obtained by introducing diagonal lines in two directions, lines that cross, forming angles, stripes produced with dots or combined with lines, small squares, small rectangles, small triangles, etc. Besides this a greater contrast was introduced in the colors, these having been arranged to producing special ombree or special changeable effects.

A beautiful stripe effect is shown in Fig. 2. This contains colored bands formed by eight thin stripes of medium color running down the warps, one-half of which has a special shadowing on the left, obtained with very short thin lines of the same or different colors and inclined upward; while the remaining stripes have the shadowing of the right formed by very short lines inclined downwards. The bands of thin stripes have three narrow lines of a much different color in between. Across the width of the material run bands of other shadowed stripes of the same nature as the above, but less broad and of lighter and very contrasting color. The latter are also alternated with three thin lines of darker color with those previously employed. A very fine pattern of the above design contains violet bands running down the fabric, alternated with three bright orange lines, and bright green stripes running across the width, having in between bright red lines. For the violet a color paste with Methyl Violet was used in this instance; for the orange a suitable Basic Orange; for the green Brilliant Green, and for the red Rhodamine B.

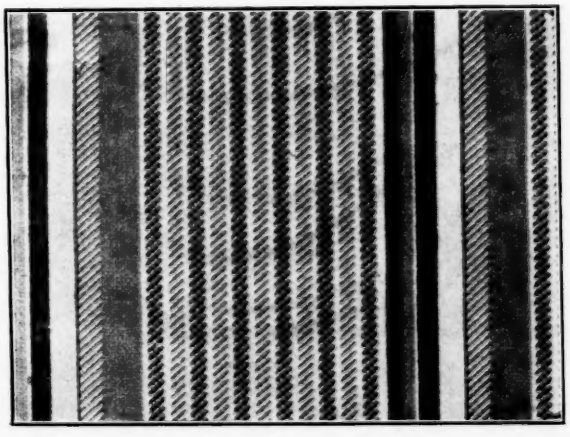

FIG. 1

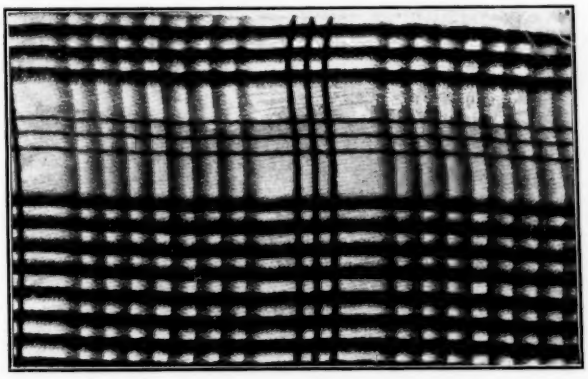

FIG. 2

The effect can be changed by producing the stripes with thin very close parallel lines, by themselves, or alternated with filled stripes; by using thin diagonal lines in all stripes having all the same or different directions, and forming the same or different angles; by using undulated lines with all curves in the same or in a different direction; zig zag lines; small, close horizontal lines, thin stripes, etc.

The Plant Required

The equipment needed for the above printed effects may consist of a multi-color printing machine, a hot

flue, a cottage steamer, a belt or chain drying machine, etc. A color printing and drying plant largely employed for the purpose is constructed on the principle indicated in Fig. 3. This shows a three-color printing machine P of the ordinary design, where the frame is slightly altered at the base to accommodate a pressure bowl under exceptionally powerful leverage and heavy weights. This consists of a strong cast-iron drum, the supporting shafts of which turn in ball bearings. Screws are furnished for lifting each of the sides of the bowl separately, but if desired the machine can be provided with a cross shaft, worms and wheels, so that both sides may be adjusted simultaneously.

The machine is provided with three printing nips, and the engraved cylinders used in this instance are pressed against the pressure bowl by double levers, weights and springs and remain quite elastic, being placed at about the same distance from one another. Their mandrels are held in bronze bearings which slide in the frame arms and can be easily removed.

Every mandrel carries on one end a small pinion wheel which gears with a large middle pinion wheel run by an electric motor. The pressure cylinder is revolved by the engraved cylinders pressing against it. An endless screw shaft or worm works the toothed crown on every mandrel wheel to bring the different colors and portions of the design into register. The mandrels are constructed of special steel, and are supplied with a fixed and loose cone for the entrance of the copper shells with the engravings. The second of these is supplied with strong filleting, corresponding with filleting on the mandrel itself. In this way engraved shells of different widths can be used. The color spreading rollers are generally of hard wood traversed by an iron shaft. They can be supplied with

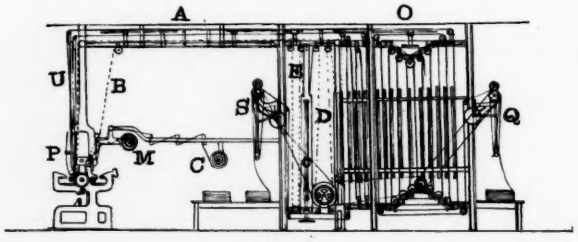

FIG. 3

a rubber covering or replaced by brush rollers. Below these are copper-plated iron troughs which can be taken out and fixed with winged screws. Color and lint doctors are supplied, and a properly working movement serves to bring the shears of the doctors backward and forward against the engraved cylinders, against which they are kept pressed by levers and hanging weights.

At the entrance of the machine is a spreading arrangement with guide rollers for the cloth to be printed and for the back cloth. The plant is driven by an electric motor directly coupled to an enclosed worm reduction gear of high efficiency, with hardened steel worm with ground teeth and worm wheel with bronze rim, the shafts being fitted with ball and thrust bearings. This method of driving has the advantage of being remarkably compact, perfectly noiseless and without vibration; the gearing, being entirely enclosed, affords the clearest working room and greatest safety to the printer.

The cloth to be printed M is entered at the back of the printing machine from a wooden roller, turned freely in bearings in two upper arms, containing spreading bars and a breast roller. Above printing machine P is supplied the upper frame U having a

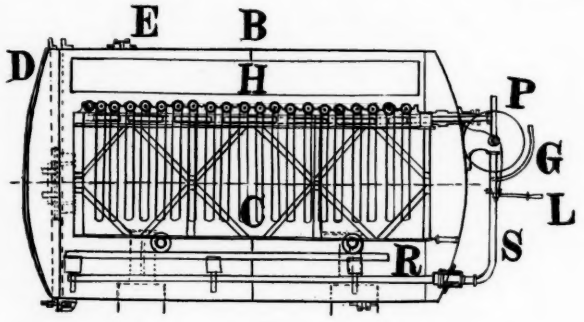

FIG. 4

collection plate for the unprinted portion of the cloth, and a small copper guide roll. Through this guide the cloth is led directly to the upper arrangement A, and conducted from there to the plate-drying oven O, where it is treated under such conditions that no smearing can take place, leaving this by the spreading arrangement Q. The back cloth C enters on the printing machine, after passing on spreading bars just behind the cloth to be printed, and leaves the latter before it enters oven O, to pass in the drying compartment D and be delivered to the second plaiter S. The blanket B also receives in this instance a drying in compartment E while passing continually on the pressure bowl of printing machine P.

THE COTTAGE STEAMER

A steaming cottage that has found a very general use for the treatment of cotton fabrics printed with basic colors is constructed on the principle shown in Fig. 4. This contains a large horizontal iron case B carefully covered in a suitable manner in the inside to avoid the formation of rust. It is closed by the iron door D, provided on one side with solid iron hinges, so as to be easily opened or closed by the operatives, and fixed against the boiler by a special spring arrangement.

The interior of the machine contains a long iron carriage on which the printed and dried cotton goods

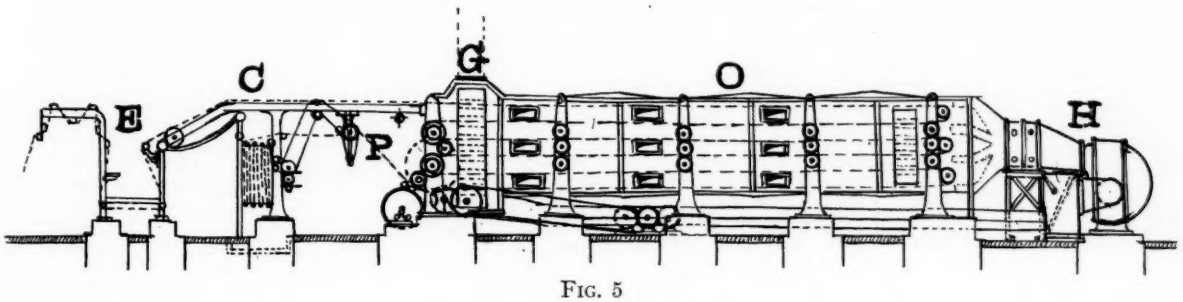

FIG. 5

to be steamed are hung on upper rollers to form many uniform layers one after the other. The carriage has low iron wheels which run on rails placed in the oven itself. The hanging rollers have small iron pinion wheels moved by a fast and loose pulley P, on which a leather belt running from an upper transmission is displayed by the iron guard G and lever L. Through this arrangement all the folds of cloth can be moved continually up and down, exposing all portions to the action of the steam.

Boiler B has the special steam heater H for maintaining the same temperature in the interior, the perforated iron coil R for introducing steam, and the vapor tube E. A pressure guage is also furnished, by which the conditions in the interior of boiler B can be controlled at any time.

THE CHAIN-DRIVING MACHINE

A chain or belt drying plant of great value in this type of printing, as it delivers the goods smoothly throughout, is constructed on the principle shown in Fig. 5. The equipment comprises three parts, the entrance frame E, the drying oven O and the conditioning compartment C. The entrance frame has iron sides that contain between them a light metal platform slightly raised above the floor of the print room. To this the operatives have access by the low steps and can seat themselves while watching the entrance of the material, which mounts between the clips of a pair of endless chains. These clips stretch it while carrying into oven O.

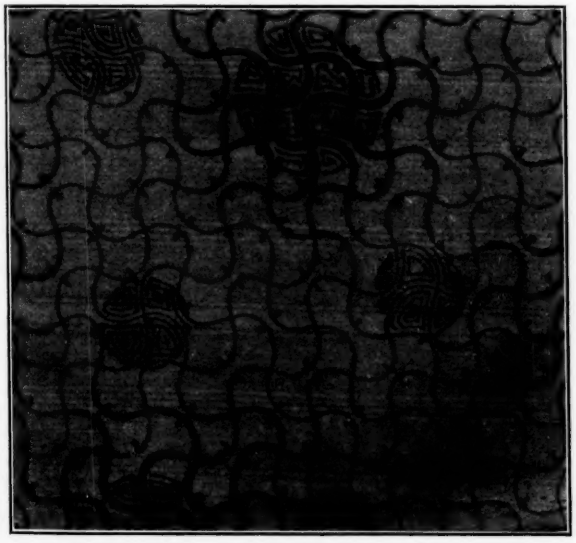

FIG. 6

The oven is a large solid rectangular construction and in it the pair of endless chains run twice backward and forward, being kept throughout under the necessary tension by large wheels. The chains move in guides, and the clips are so arranged that they are open when they first come in contact with the ends of the fabrics, which can thus enter between them without difficulty. They are closed automatically as the material passes forward, only relaxing their clutch when the chains make their exit at the bottom of the machine. The interior of the oven is so arranged that the fabrics come in contact with no guide rollers whatever, and remain with every portion exposed to the action of the hot air that reaches them from all sides.

Oven O is warmed by a large iron heater H, having steam radiators and a ventilator. Here a continuous stream of hot air is produced and is uniformly distributed all through the oven, so that every portion of the cloth is reacted upon by the hot air, which is carried off by a conveniently placed chimney; all steam is eliminated in this way. The conditioning oven C is simply an open frame with several upper and lower binding rollers, on which the cotton cloth is passed in contact with the air of the treating chamber before being folded in the form of pieces by a special plaited P.

The dried printed fabric leaves the oven O at the bottom, and after passing over a heated cylinder, is carried upwards without the endless chains to pass through the conditioning apparatus. Here it receives a certain cooling and can regain moisture before being folded in piece form by P.

To obtain even finer goods some manufacturers use at present carefully prepared cotton fabrics having white or lightly colored rayon stripes or designs that reflect later below the printed design as shown in

Fig. 6, adding luster to the bright effects produced with basic colors. In this case no particular attention is given if the effects printed above correspond with the rayon patterns woven below in the material, and it is just the irregular position of the latter that renders the design interesting to some consumers.

The rayon grounding can be varied very much. Thus the rayon designs can be very thin or wide; can appear all through in every portion of the material, or only in given portions; can be of white or colored threads; can be on a material with or without perforations; can remain unprinted, or from only the printed portion, etc. There are cases in which the fabric can be obtained in a straight condition before the printing operations, and where this can be maintained during the application of the colors, which are therefore deposited only in the desired places. In this way both the rayon and the printed designs can correspond, and very fine effects can be produced, especially if the rayon threads have been dyed in one color and the printed effect contains one, two or more contrasting colors. Very fine ombree and composition patterns are thus possible.

(*To be continued*)

Recognition for the Color Name as a Trade-Mark

A Case in Which the Patent Office Finally Accepted a Term Alleged to Be Descriptive

By Waldon Fawcett

THE axiom that there are exceptions to every rule holds good even with respect to the code which has restricted the trade-mark recognition of color. This is the substance of the latest development in the administration of the governmental clearing house for trade-marks. The concession is one of considerable significance to the dyestuffs industry, coming as it does in the midst of this age of popular enthusiasm for color which has, in turn, made new demands upon color names.

If there is one principle of Federal censorship of trade-marks which may be called fundamental, it is that which denies registration at the U. S. Patent Office to "mere color" as an exclusive indicia of commodity origin or ownership. The logic is unassailable. Given a limited number of primary colors and a comparatively limited number of secondary colors it is obvious that if branders of merchandise were granted monopolies of use for the respective colors of their choice it would be no time at all until the spectrum was pre-empted and all later labelers would find themselves hampered in the use of what is essentially common property.

Current interest is not, of course, in this basic principle, which is long established and well known, but in the exception which has been allowed. This deals with color names rather than with color itself. So close is the relationship, though, that the trade-mark traffic officers at Washington have, in the past, been just as conservative with respect to the appropriation of generic or standard color designations as they have been with regard to the attempts to isolate, as private property, a color or combination of colors.

The persistence of the Frank & Cohen Silk Corporation, of New York, is responsible for the modification of policy at the Patent Office which recognizes different degrees of descriptiveness in color names and allows privileges to the little known or less familiar color name that would never be conceded to the leading color titles. Frank & Cohen Corporation made application, some time ago, for the registration of the word "Porcelain" as a trade-mark for fabrics in the piece of silk and rayon. The application was rejected at the outset, and admission was won for the name only after the silk marketer had appealed over the head of the examiner of trade-marks to the authority higher up.

No Registration for Descriptive Term

The examiner of trade-marks refused registration on the ground that the word "Porcelain," applied to textiles, is descriptive in that it merely indicates the color of the goods. Under the trade-mark law (the Act of 1905) any word or phase is taboo which is merely descriptive of the goods on which it is used, or of a quality of the goods. What rendered the action at the Patent Office especially interesting, if not unique, was that the examiner barred "Porcelain" from the register because he found the name included in the index of colors copyrighted by the Textile Color Card Association of the United States.

Thus, it fell out that the real issue in this test case was whether the charts, lists, or directories of colors issued by the various private organizations or institutions in the United States which essay reference service of a kind, are to be accepted by the Government as authoritative in so far as their color nomenclature, etc., is concerned. When the case went to trial on appeal before the U. S. Commissioner of Patents, the representatives of the silk company frankly assailed the idea that the Color Card Association Index is sufficient as legal evidence that "Porcelain" is the name of a color to the extent that it becomes a descriptive word.

In challenging the color authority relied upon in the Trade-Mark Division of the Patent Office, the representatives of Frank & Cohen Corporation asserted that there is no evidence that this association, which is a membership corporation, has ever been recognized by anyone as an authority on the names of colors, except by the examiner of trade-marks. On the contrary, said the spokesman for the silk brander,

"There is excellent evidence that it is not such an authority." As proof of fallibility there was cited the fact that the Color Card Association Index for the year 1927 (the edition used by the trade-mark examiner in this instance) omits the commonly known colors, *red* and *green*.

For the sake of comparison with the lexicon of the Color Card Association, the Frank & Cohen counsel brought out the fact that no suggestion that "Porcelain" indicates a color may be found in the leading dictionaries, such as the New Standard and the Webster International, which are generally accepted by the Federal courts. Editions of these dictionaries published after the name "Porcelain" is said to have made its appearance in the index (that is, following the spring of 1921), fail to make any mention of color significance for the word.

Offered as evidence at the trial was correspondence between Frank & Cohen Corporation and the compilers of the Textile Color Card Association Index in which it was indicated that the association had no objection to application for registration for the word "Porcelain" as a fabric mark, and notation was added that the color card on which the name "Porcelain" appears is more generally known in the trade as "Porcelain Blue." On this evidence, the representatives of the silk marketer immediately made the point that "Porcelain Blue" is a unitary expression and that the two words are no more separable than the individual letters of these words.

Exception Made in Registering "Porcelain"

Returning to the attack on the Textile Color Card Association, with the evidence of the ignoring of the blue annex in the name in question, the pleader for Frank & Cohen said: "This clearly indicates that the Color Card Association does not make its index follow the trade terms but seeks to force upon the trade and the public certain words as the names of certain colors; but such words have never been and are not now the names of such colors." Hence the Frank & Cohen view was that the index is unreliable for official use at the Patent Office and that the only functions of the names and numbers listed in the index are for the identification of the individual cards. It would follow that only when a card has been identified by its code number or code word, and the color noted in that connection, would the code word or number have any significance as to color.

In deciding the appeal in favor of Frank & Cohen Corporation the reviewing authority accepted most of the premises. The commissioner said that if it is a fact that the word "Porcelain" has been and still is actually used in the trade to indicate a certain color of a fabric, obviously the word is descriptive. But, he added, that he was not satisfied that the mere presence of the word in the index establishes that the word is known and used in the trade in this descriptive manner.

Incident to the appeal, the Patent Office head had correspondence with the managing director of the Textile Color Card Association. The latter explained that "Porcelain" is a color appearing in the special or seasonal color cards rather than on the standard cards which carry staple colors. But the executive of the Color Card Association went on to say that all the terms listed in the index are in common use, some industries using more than others. Disposing of this contention in his final opinion, the Patent Commissioner remarked that there should be some satisfactory evidence, in addition to the index itself, to corroborate the statement of the manager that all the terms listed in the index are in constant use. "Porcelain," in ultimatum, only if it be clearly established that the word is known in the trade, as indicating a character or quality of the goods. "The index alone," he commented, "is not believed to fully establish such fact." Hence he reversed his subordinate, the examiner of trade-marks, and opened the registry door to the "Porcelain" silk-mark as originally nominated.

SOME NEW PROBLEMS IN DYEING RIBBONS

(*Continued from page* 90)

effective solution for ribbons containing about a third of natural silk is made with 10% of Marseilles soap and 3% of calcined sodium carbonate in a temperature of about 225° F. for about three hours. Rinsing follows in cold water.

Some ribbons have to be singed before degumming to dispense with the miniature fine filaments and fluffy stuffs that adhere and that if not removed will tend to impair the dyeing. Treatment in a bottoming bath is almost always necessary to get satisfactory results with this mixed class of ribbon and is effected in a bath composed of about 4 pounds of crystallized sodium sulphate, 1 pound of soap and a little soda per liter of dye liquor. Substantive dyes that will color both the silk and the cotton in the ribbons alike are used. The temperature of the bath is raised to about 225° F., and kept close to the boiling point until the desired shade is obtained.

Brilliance of color and finish appear to be the paramount features in the ribbons more than the nature of the texture, elasticity or lasting qualities. The color is heightened several degrees by immersing the ribbons in one of the acetic or formic acid baths, although care has to be taken to avoid altering the color tone of the light shades.

Each of the different raw materials in the ribbons will pick up the dye somewhat differently, particularly the rayon, which will absorb more than the cotton. In the case of ribbons woven with silk, rayon and cotton warp threads and an all-silk filling, this difference in the absorptive nature of the fibers may cause a streaky condi-

tion unless the filling covers the warp efficiently or the dyer has been fortunate enough to select a dye which will color all of the threads equally. But when the three classes of fibers are carded, combed, drawn and spun on the worsted system, or carded and spun on the woolen system, the material becomes so well blended that even dyeing is more certain, as all threads will be the same. Since the use of staple fiber, which is the long filament of th rayon product cut into staple lengths, it has been possible to mix this fiber with wool, silk or cotton and card and spin them together. The use of the synthetic fibers in silk ribbons simply creates one more problem which the dyer must solve to produce a satisfactory job.

Increasing the Absorptivity of the Cotton Helps

If dark and light blemishes appear in the ribbons which contain a form of rayon that absorbs more of the dye than the cotton, it is possible to adjust matters by increasing the absorptivity of the cotton without increasing that of the artificial silk. The treatment is simple, consisting in submitting the ribbons to a bath of caustic soda for about an hour with the liquor at a temperature of 140° F. Rinse and sour in a bath containing a small amount of hydrochloric acid. This treatment will enhance the affinity of the cotton for the dyestuff and assist in leveling the color.

Although the sizing and finishing of the ribbons may be conducted in another department, and out of the jurisdiction of the dyer we will mention the process briefly, as it is important to give ribbons the looks and feel required by the consumer. A luster has already been partly put on and this must be further improved and the fabric given a softer handle without impairing to the color.

Modern appliances for applying the sizing make the work easier than formerly, and when the proper gums, starches, gelatines, oils or dextrins are employed in the sizing mix, it is not difficult to make an effective application of size. The sizing compounds must necessarily vary so much to conform to conditions that it is not practicable to give concrete formulas here. The sizes are usually applied when the ribbon are under tension. after which the ribbons are drawn over steam-heated cylinders for drying and then are calendered, thus completing the processes.

FRANKLIN KALBFLEISCH

Franklin H. Kalbfleisch died at his home in Babylon, Long Island, on January 30, 1929. He was born in Brooklyn, N. Y., on March 3, 1846, and spent his lifetime in the chemical business. Mr. Kalbfleisch was a son of Martin Kalbfleisch, who came to this country from Holland in 1829 and established the chemical business which Franklin H. Kalbfleisch entered in 1870.

During his lifetime Mr. Kalbfleisch organized many companies in various branches of chemical manufacture and later these were consolidated into the Kalbfleisch Corporation, of which he was the head until 1920 when, due to ill health, he retired from active participation in the business. Mr. Kalbfleisch was a man of resolute personality, but of kindly and generous disposition and enjoyed the respect of all who knew him.

SILK MEN REVIEW THEIR YEAR'S WORK

A number of important things were accomplished during the past year in the silk industry that will be of lasting benefit, according to Paul C. Debry, chairman of the Broad Silk Division. Last week this division of the Silk Association held its annual meeting and the members reviewed the year's achievements. A design registration bureau was organized in 1928; a system of standardizing grades for finished piece goods was established; limits were laid down for the weighting of piece goods; costs systems for silk manufacturers were standardized; and uniform contract forms for raw and finished goods were adopted.

The establishment of limits for weighting, Mr. Debry said, accounted for some of the recent activity of his Broad Silk Division. Twelve meetings have been held to discuss the subject and a definite schedule was adopted. The co-operation of dyers and finishers, most important in this movement, has been obtained and a system of control has been worked out. Both dyers and manufacturers will report to the Silk Association the shipment or receipt of any piece overweighted, and the co-operation of various other organizations and the Federal Trade Commission will aid in the enforcement of this agreement.

BRITISH DYE CORPORATION PLANS ENLARGEMENT

The plant of the British Dyestuffs Corporation and other manufacturing facilities will be improved and enlarged by an expenditure of $1,500,000, according to a statement made by the mayor of Huddersfield at the annual meeting of the Huddersfield Chamber of Commerce last week. The works at Dalton, Huddersfield, when completed, will employ another 1,000 operators.

THE I. G. PLANS NEW AMERICAN FIRM

More American capital is to be enticed into the coffers of the German dye trust, according to a story published in the Frankfurter Zeitung, official organ of the I. G. Farbenindustrie. It is stated that the German dye trust has arranged to form a holding company in the United States and that the plan has the support of certain unnamed financial interests here. Further light on the matter came with an admission from the Berlin office of the I. G. that negotiations for such a holding company were actually pending, but that they were in such an early stage that no public announcement can be made as yet.

AMERICAN
DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

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NOT EXCITING, BUT IMPORTANT

OUTLINES of everything from anatomy to zoology are popular to-day with the reading public. There is much to learn about almost any subject one may choose to study, far too much for thorough knowledge, and because there is so much to be learned we have caught the habit of skipping and skimming. We skim through an outline of everything that looks simple and pass over anything that looks complicated. This is one of the chief reasons why most people do not like to read about the tariff situation. It looks too hard; many will not even skim over an intelligent outline of it.

But the tariff is very important at this time to business men. They cannot justly excuse any attempt to dodge the issue merely by saying the subject is not interesting. The fact that it is an issue, a live issue, should be sufficient reason for everyone's becoming informed on that part of the tariff which most concerns their industry.

One tariff issue that deserves all the study that readers of the REPORTER may give to it, as we stated two weeks ago, is the protection of the domestic dye industry. Let us grant that this issue does look rather complicated at first glance; let us admit that few angles of this question are attractive and that the subject as a whole is not a very exciting business to most of us. Why study the thing? It is much easier to skip over whatever the newspapers say about it.

But it must be granted also that the issue of tariff protection is extremely important to the future welfare of our dye industry and for that reason it is an issue of great moment to consumers of dyes. The subject of foreign currency is not generally interesting, but when traveling abroad it is important that one know something about rates of exchange if he is to get around smoothly. By the same token, if our dyestuff industry is to keep traveling in the right direction, those who will be most affected by its future development must make it their job to know all about the present tariff situation as it was outlined by the industry's spokesman at Washington four weeks ago before the Ways and Means Committee. The following editorial discusses one phase of the question; others will appear later on different phases.

TRIED AND FOUND INADEQUATE

NOW that the tariff needs of the American dye industry have been laid before the Ways and Means Committee the question arises, How much arguing must be done before those needs are fulfilled by the new tariff?

The needs, we have said before, are very simple; more adequate protection is all they represent. And the various reasons for seeking this adequate protection for the dye industry were clearly stated by the spokesman for the domestic manufacturers at the tariff hearings last month. All the pertinent facts were carefully built into a strong brief that was filed with the tariff committee. It was urged, as one definite step toward protection, that the American selling price be retained as the basis of valuation for imports of competitive dyes and other coal tar products. The fact was emphasized that the cartel system on which all the big European dye trusts operate, results in much lower costs of production and distribution than those borne by our manufacturers; secondly, that the prices of domestic dyes have steadily declined in the past eight years, despite the numerous warnings issued in 1922 regarding a dye monopoly in this country; and thirdly, that the dye industry is of vital importance both in its close relation to other industries, such as textile and chemical manufacturing, and as a great national asset.

These three facts were advanced to support the industry's request for a return to the higher ad valorem rates of duty originally embodied in paragraphs 27 and 28. The higher rates are needed because the present rates are not protective in any sense on certain very important classes of dyes.

That the existing ad valorem rates are inadequate can be proved beyond question. The great difference between the economic structures of the American and the European chemical industries ought to be sufficient proof. It implies just as much of a difference in their costs of operation. It is chiefly this which makes it possible for a large variety of the higher-priced foreign colors to break through the present American tariff.

"Under the cartel system manufacturing operations are concentrated at strategic plants, overlapping and duplication are eliminated and all of the obvious attendant advantages realized. In the field of research this concentrated effort and elimination of duplication is tremendously valuable. The benefits of this system extend still further, into a part of the business which is always very costly. This is in the marketing as well as in the executive personnel."

The above is quoted from the dye industry's brief filed with the tariff committee. So much for the system

that stands behind the foreign competition in our dye trade. As to the effects of that system upon the domestic markets, our dye imports tell the story. The present tariff rates do not protect where they should protect. The competition is keenest in the high-grade, high-priced products, such as vat dyes. That fact is too obvious to be denied.

The import figures compiled by the Tariff Commission show that since the reduction in ad valorem rates in 1924 there has been a considerable increase in imports, especially in certain types of colors. Imports during the years 1925, 1926 and 1927, which are the years that followed the rate reduction, reached a total poundage each year higher than for the pre-tariff year 1921 and higher also than for the first three years of the tariff, when the original rates were in force. Furthermore, in the period from 1922 to 1927 a quantity of foreign dyes varying from 38 to 49 per cent of the total poundage of all imports was in the *vat dye class*.

The Dye Census supplies some significant figures on vat dye imports. The census for 1927 lists twenty-six vat colors that were imported into the United States in the largest quantities during the year, and of those twenty-six colors fifteen were imported in 1927 in larger quantities than in 1924. A color such as Vat Golden Yellow GK, for instance, showed total imports of only 1,000 pounds in 1924, but 65,500 pounds in 1927; of Helindone Printing Black RD Paste only 8,300 pounds were imported in 1924, but three years later the total had reached 123,000. "Wherever the product is an expensive one," Dr. Killheffer told the Ways and Means Committee, "the protection is inadequate at the present ad valorem rates."

There are those who still scoff at the idea that our dye industry needs better protection or that the present tariff is inadequate. They will argue that our imports represent only 4 or 5 per cent of the dyes consumed here. But that percentage refers only to quantity. Actually our *imports* represent 20 per cent of the value of our dye trade and 75 per cent of all the varieties we use. The value in this case indicates the degree of competition in higher-priced products.

But the fact that the domestic industry can profitably sell only 25 per cent of the variety of colors consumed by our mills indicates something else. It indicates that in its future development the industry must increase its output of all vat dyes and other high-grade products and must be able to market such colors at prices no higher than those of its foreign rivals. This is not to be achieved in a month or a year. But it must be accomplished if we are to supply the growing demand of the American public for fast dyes. Certainly this demand will not die out; rather it will continue to grow and with it will grow the need for a much larger variety and range of fast colors at reasonable prices.

"To what extent are the American dye manufacturers prepared to make those dyes in case the duty is put on?" asked Representative Richard S. Aldrich of Rhode Island at the tariff hearings. Dr. Killheffer replied, "The American manufacturers are already making them in very large amounts . . . in larger amounts each year." Even the high-grade dyes?" asked Mr. Aldrich. "Yes," was the reply, "that is where our development is to-day."

It is the need for uninterrupted development in this field of high-grade dyes, in other words, that makes adequate protection so necessary. Technical research has opened to our manufacturers the whole broad field of fast dye manufacture. If the results of their long labors are to be passed on to the domestic textile industry in the form of less expensive vat colors in greater variety, then there must be adequate protection. And this protection must come in a return to the higher ad valorem rates, for the specific rates of the tariff protect only the cheaper products.

EXTRACTORIALS

One of the most important problems facing us at the present time is the elimination of the evil of overweighting. We of the silk industry have as the product of our looms the most beautiful textile fiber in the world. For centuries it has been considered as the most luxurious and desirable of fabrics. And what has happened? To-day it has become necessary to prevent silk manufacturers from destroying by excessive weighting this enviable reputation of their product.—*H. Schniewind, Jr., President of the Silk Association.*

In the immediate future the American dyestuff industry will doubtless need to meet increased foreign competition, and small manufacturers will have even less of a chance for survival than they have had in the recent past.—*Arthur D. Little Bulletin.*

Although we have made advances in applying the principles of co-operation and research, the future holds opportunities for greater progress along the lines of, first, the interchange of operating information; second, recognition of the necessity for closer understanding between manufacturer, distributor and consumer; and third, the application of scientific research to manufacturing in all its branches.—*Lincoln Baylies, President of the National Association of Cotton Manufacturers.*

What all dyers need to-day is less of the mystic spirit and more of co-operation among themselves—the exchange of each other's views on dyehouse difficulties and economical ways of running. I certainly do not mean that every Tom, Dick and Montgomery should be allowed free access to the dyehouse archives; but I do mean that the dyers should cast off the halo of sorcery and enter

more into the class of professions or trades.—*T. P. Sheridan, in Textile World.*

While virtue is its own reward, the man who evolves an idea of mechanical or chemical nature that has intrinsic value when applied practically is not satisfied to find recompense for his study and expenditure in the pride of having brought forth something original.—*The Textile Review.*

This is a glorious business. It is full of tradition and romance. Not too much profit, I'll admit. It is a constant struggle. A fight for profits. Some of us can honestly point to results. I would like to see everyone thoroughly satisfied, then the better managed ones would get rich beyond the dreams of avarice.—*"A Leading Selling Agent," in Daily News Record.*

As a thoughtful man travels the new way to net profits and explores its tributary by-ways, he observes that the road leads through a composite understanding of markets, merchandising, distribution, sales forecasting, production planning, expense budgeting and analytical research."—*Fred W. Sibley, Bankers Trust Company, in Commerce and Finance.*

The essentials of a successful cotton mill proposition, without regard to personnel, would include a definite policy of limiting the product to a few standards and nonconflicting lines rather than too much diversification or, on the other hand, an outstanding ability to handle style and seasonal goods.—*Herbert G. Beede, of Sales & Jenks Machine Company.*

NEW INSTRUCTOR AT LOWELL TEXTILE

Franz E. Baker now holds the position of instructor in cotton yarns and knitting at the Lowell Textile Institute, Lowell, Mass., succeeding Nathaniel E. Jones. Mr. Baker was graduated three years ago from the textile engineering course and went directly to the cotton research laboratories of Lockwood, Greene & Co. He was later transferred to the South, where he has been engaged in research work in several large mills.

Mr. Baker was a member of the student branch of the American Society of Mechanical Engineers during his enrollment as a student at Lowell and is a member of the Gamma Chapter of the Phi Psi.

Mr. Jones, the previous instructor, is now superintendent for E. A. Watkins, cleaners and dyers of Portland, Me.

The United States Tariff Commission has issued its report on Sodium Silicofluoride, containing a study of differences in cost of production of this chemical in the United States and in the principal competing countries.

RECENT LITERATURE

Chemical Research in America

Annual Survey of American Chemistry—Vol. III: July, 1927, to July, 1928. Edited by Clarence J. West. Published for the National Research Council. New York: Chemical Catalog Company. 395 pages. $3.00.

IN the age of Galileo all science moved so slowly and slightly compared with its progress to-day that any attempt to make an *annual* survey would have been absurd. It could have been printed upon a postage stamp, and only two or three lines of such a survey would have dealt with progress in chemistry.

But now, if the man of science would know where he stands in relation to his profession, it is imperative to make a survey of scientific progress every few months; for the speed at which this age of industrial development travels is very contagious and affects some branches of science more than others. Chemistry is unquestionably the outstanding instance of an industrialized science moving forward at breathless pace to keep a step or two ahead of industry. Chemical research is pursued constantly and rapidly everywhere, in every country that realizes its importance to national welfare—and to-day that means every major power.

To be readable our survey, consequently, must be issued annually, and for American chemists it must be so narrowed as to exclude all chemical research carried on outside of America. This task has been admirably undertaken each year by the Division of Chemistry and Chemical Technology of the National Research Council, and the volume under review is the third in a notable series.

The editor, Clarence J. West, is director of the Research Information Service of the Council, and he has included each year an increasing number of subjects. The contributors to the latest volume comprise forty-six authorities in their special fields of chemistry. The editorial board has adopted the policy of varying the subjects from year to year, which will mean that certain less active fields will be covered only every second or third year. Furthermore, different authors are asked to write the reviews, and the result is a symposium of chemical research progress during the period surveyed that is certain to contain some data of interest and value to every chemist.

The material is concisely and freshly presented. It covers with painstaking thoroughness the investigations of the leading research workers in each field by means of countless references to the literature and patents. This method is obviously stimulating. It should impel the technical man of progressive mind to trace through to the

farthest point of advance a particular line of chemical study.

In the current volume many of the chapters come under the general head of inorganic chemistry, and more specifically metallurgy; but among those dealing with advances in fields of organic chemistry that should be of interest to dye and textile chemists, those on colloid chemistry and on rayon merit careful study. Progress in the former field is reviewed by Harry B. Weiser, professor of chemistry at the Rice Institute. Rayon is discussed by W. Hale Church; Cellulose Chemistry by Louis E. Wise and Floyd C. Peterson; Azo Dyes and Intermediates by E. F. Hitch, chief of the Azo Dye Division of Jackson Laboratory, Du Pont Company; Anthraquinone Dyes by Ivan Gubelmann, technical director and vice-president of the Newport Company.

A Year at the Standards Bureau

Annual Report of Director of Bureau of Standards; Department of Commerce. 46 pages.

WITHOUT regard to its political views, American industry may very well have one regret over the outcome of the Presidential election last fall. The election took Herbert Hoover from his post as Secretary of Commerce at a time when industry and trade were awakening to the great importance of his department to their welfare. It is, we trust, no disparagement of the new Secretary to assert that few other men can hope to excel Mr. Hoover's work as head of the Government's busiest department.

Of all the bureaus grouped under the Commerce Department, the Bureau of Standards has always been of most interest to technical men in industry, and they have not only watched its progress but have shared in its activities to a large extent, through the co-operation of various scientific societies. Well organized, expertly directed, with a high-grade personnel, the Bureau has in recent years branched out into fields of scientific research and standardization that should be of value to the future of all our industries. Its annual report explains its operation, outlines its projects concisely.

Under an arrangement consummated in September, 1927, the Bureau's activities were divided into two main groups. The first comprises all those activities having to do with scientific research and testing, the development, construction, custody and maintenance of reference and working standards, their comparison, improvement and application. The second group includes the supervision, direction, formulation and co-ordination of commercial standards, with particular reference to the needs of industry.

Most of the Bureau's work is made effective through the voluntary co-operation of the State and municipal governments, scientific and professional societies, trade associations, manufacturers and individuals who accept the findings of the Bureau and incorporate them into a State law, a municipal ordinance or a standard of quality, performance or practice. At the present time the Bureau is co-operating with over 200 scientific, technical and industrial organizations. At the close of the fiscal year there were eighty-two research associates stationed at the bureau, representing forty-six industries and associations.

Readers of the REPORTER are, of course, well informed on the work being carried on at the Bureau in the testing and standardizing of dyes for fastness. A large part of this research has been undertaken for the American Association of Textile Chemists and Colorists, which has had a research assistant at the Bureau for more than two years.

One project in textile testing at the Bureau's laboratories has been concerned with the transparency of fabrics to ultra-violet light. Another of interest to dye chemists has been the standardization of Lovibond glasses, a study taken up in co-operation with the American Oil Chemists' Society and involving a vast amount of work on the colored glasses used in various combinations for grading edible oils and similar colored substances. The appropriation for the investigation of textiles during the past fiscal year was $40,700.

A BOOK ON CAUSTIC SODA AND POTASH

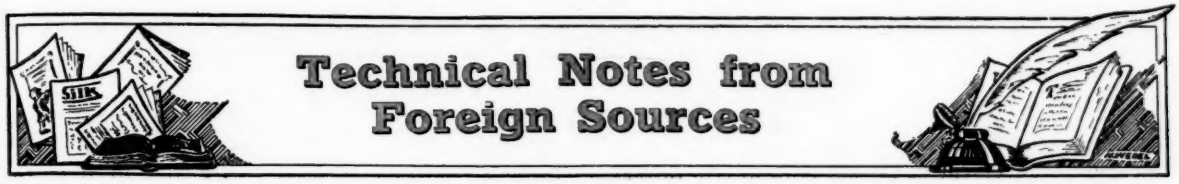
The Niagara Alkali Company has just published a leather-bound book for users of caustic soda and caustic potash. The subjects are handled in detail, as the object was to make the book a complete reference guide for every industrial process employing these chemicals. The chapters deal with the properties and packaging of solid caustic soda, the handling of liquid soda, construction and equipment of storage tanks, analysis of caustic and typical layout for liquid soda transfer and storage.

Caustic potash is equally well treated, with method of analysis, package specifications, meaning of values and tests, and description of uses. Tables simplify the use and ordering of caustic soda and caustic potash.

Copies of this book will be forwarded without charge upon request to Niagara Alkali Company.

The Bureau of Standards' Journal of Research for December contained an article on "Use of the Underwater Spark with the Hilger Sector Photometer in Ultra-Violet Spectrophotometry," by H. J. McNicholas. This contains data of interest to research workers employing the sector photometer in dyestuff testing, and is illustrated with diagrams.

Edward A. Williams has resigned from the Boston branch of John Campbell & Co., and has announced that he is planning to organize his own dyestuffs business. He is at present traveling in Canada, and will give out the name of the new firm on his return.



Experiences with the Iodometric Evaluation of Enzymatic Definishers

R. Haller, J. Hackel and M. Frankfurt; Mell. Textil-Ber. 309, 9 (1928).—A very careful discussion of the methods already proposed, and of the method worked out and recommended by the authors. The method consists of the following steps: (a) Standardization of the N/10 iodine solution, by adding an excess of it, 20 c.c. to 25 c.c. of a glucose solution containing about 0.1 g. of glucose, adding 50 c.c. of a mixture of equal volumes of 2/5 molar soda and 2/5 molar bicarbonate solutions. letting stand in the dark 1½ to 2 hours, then acidifying with 12.5 c.c. of 25% sulphuric acid, and titrating back with N/50 thiosulphate. (b) Analysis of the starch: dry content and ash determined as usual; 5 g. of the sample is hydrolyzed by pasting up with 150 c.c. of water, 10 c.c. of concentrated hydrochloric acid added, and the mixture heated on the water-bath under reflux for three hours; then neutralized as exactly as possible with caustic solution, and the glucose determined as before. (c) Determination of enzyme value: 2 g. of the analyzed starch (see b) are pasted up with 100 c.c. of distilled water, at 70° C., and the mixture allowed to cool to the optimum temperature for the enzyme-action; then 6 to 25 c.c. of the ferment solution, corresponding to 0.15 g. substance are added, and reaction allowed to proceed for exactly 15 minutes with stirring; whereupon the mixture is brought to a boil during five minutes, and boiled for about two minutes. Then when cooled to 15° C., the mixture is diluted to 250 c.c., and in 20 c.c. of the liquid the maltose is determined as $C_{12}H_{22}O_{11}:1H_2O$. Simultaneously 25 c.c. of the ferment solution are diluted to 250 c.c., and 20 c.c. of it titrated as a check. In this case boiling is unnecessary, as the iodine value is the same before and after boiling.

A large table of results, involving nine different commercial brands of ferments, is included in the paper.

Explanation of Certain Reactions and Dyeing Procedures

Dr. Marcel Bader; Mell. Textil-Ber. 314, 9 (1928).—A lecture delivered before the Twelfth Congress of the International Association of Chemists-Colorists in Karlsbad. One of those general but interesting and suggestive papers which do not lend themselves to abstracting. It is of a chemical, rather than of technical, nature.

Investigation of Indigo Losses in the Vat

Prof. M. Tschilikin; Mell. Textil-Ber. 318, 9 (1928).—The loss of substance in the Indigo vat varies, but is always serious. Estimates vary from 5% to as high as 30% (J. Soc. Dyers Col. 26, 1907), according to the reducing agent used and the temperature prevailing.

Three possible explanations are advanced: (a) Formation of isatin, through dehydroindigo, by oxidation of indigotin through hydrogen peroxide, generated in some obscure way in the oxidation of the vat; (b) overreduction of indigotine to indoxyl, and subsequent oxidation of the latter to isatine; (3) oxidation of the keto form of leuco indigotine to indoxyl, and of this to isatine.

The author concludes for the third explanation: "The course of the reaction is most easily to be assumed, is comprehensible and simple. Such a course is possible under all circumstances, even when no excess of reducing agent is present. If tautomerism is involved here, then the quantity of indigotin destroyed will not always be the same, but will depend upon the ratio to each other of the two tautomeric forms present; this ratio is dependent upon the temperature and other factors, and can therefore be altered in one direction or another."

Artificial Fats (Synthetic Chemical Compounds with the Properties of Fats)

H. Pomeranz; Mell. Textil-Ber. 324, 9 (1928).—The author states that his title (the one quoted parenthetically above) more correctly covers the point at issue than do those of Ad. Gruen ("The Synthesis of Fats in the Laboratory and in Practice") and of Prof K. H. Bauer ("The Significance of Synthetic Methods of Fat-Chemistry"). The author's attitude is that the two writers cited have made unfounded claims as to the value of certain new chemical substances of, in a general sense, fatty nature, in textile work, and he discusses the subject in a full way. We add, in condensed form, some of the points which he makes.

Gruen and Bauer (independently) appear to regard as synthetic fats the esters formed from naturally occurring fatty acids, as such or in altered form, with glycerol or other alcohols, which from purely a chemical standpoint might justify the titles which they employ. But if one regards a fat or oil as dependent for that title upon a certain physical condition (better expressed, upon the possession of certain physical properties) which does not involve a certain viscosity, but which can be recognized by a certain "feel" when rubbed between the fingers, then the glycerides of the higher fatty acids form only a part, though a predominant part, of such a group of substances, and the glycerides synthetically prepared can properly be called synthetic fats only when they are absolutely identical with the corresponding natural ones. When this is not the case, we have to consider new fatty

preparations built up from natural fats, whose classification Dr. Gruen sets forth through the following three groups.

1. The regeneration of neutral fats or acid waste fats as they occur in the refining of natural fats.

2. The improvement of certain natural fats through certain synthetic methods, or, as Professor Bauer calls such transformations, the "ennobling" of natural fats.

3. The production of the glycerides of such acids as do not occur in actual fats.

This last group might be taken to refer to or include substances obtained synthetically from the elements. As the two authors referred to regard it, such fatty acids would be those produced by chemical alteration of naturally occurring fatty acids.

Furthermore, the syntheses thus far carried out of fats identical with natural ones are characterized by Professor Bauer as follows:

1. Fatty acids as well as glycerol are prepared synthetically.

2. The fats are synthesized from their (synthetic) "cleavage products."

3. Fats and oils occurring naturally are used as materials for the further synthesis of technically valuable substances.

Under the third group soaps might be included, but this is not meant at all.

The author's point of view seems to be a kind of warning against being led to believe that new products called "new synthetic fats or oils" are necessarily of value. He cites cases in which the contrary is true. He discusses interestingly the case of sulphonated and of polymerized castor oil. In reference to one product of this sort, of which the claim is made "that it, in spite of its high molecular weight, is not solid at room temperature, but remains fluid, and even at higher temperatures remains 'nicely' viscous," the author drily remarks, "But common castor oil also possesses the same properties."

For those specially interested in the subject the whole paper might be worth reading.

Investigation of the Oxidation of Aniline in the Production of Aniline Black

A. Linke and W. Schramok; Mell. Textil-Ber. 328, 9 (1928).—A lecture before the Twelfth International Congress in Karlstadt.

The paper relates principally to the serious losses or waste of aniline in the process. The authors have carried out exact investigations of the process, and find, for example, that only 90% of the aniline oil taken up by the fiber on impregnation is detectable after drying, and that after the immediately following oxidation only 45 to 50% of the aniline used can be traced in the fiber. In the first case, while the amount of aniline which has disappeared is considerable, next to no loss of the HCl of the aniline salt used has occurred, which means an undesirable content of acid in the fiber. Of the loss, about 30 to 35% is actually lost by vaporization in steaming, while 15 to 20% is utilized by oxidation to emeraldin. The rest of the 50% is not strictly lost, but plays an important part in the subsequent chroming, which the authors have tried to follow out exactly, but with only failure thus far.

Altogether, about 60% of the total aniline used is lost. It is possible to cut down the loss by using less aniline, but the amount of Aniline Black produced on the fiber also sinks proportionately.

The authors commend R. Haller's proposal to replace chlorate, ferrocyanide and chromate by Activin. They feel that with this agent there is a hardly noticeable loss of aniline in the hot flue, apparently because the rate of oxidation is so speedy that the aniline has no time to volatilize before oxidation and fixing. There is also, of course, as a consequence, less tendering of the goods from the hydrochloric acid set free so abundantly in the other process, the one studied.

Polynitro-amines Intermediates

Wm. Blythe & Co., and W. H. Bently; English Patent No. 263,552.—By heating a polynitro-halogen (aromatic) compound, in an open vessel with stirrer, with solid dry urea, the halogen is easily and smoothly replaced by the amino group. In the example given, ten parts of 1-2-4-chlordinitrobenzene and six parts of dry urea are heated gradually with constant stirring to 130° to 140°, and the heating and stirring continued until no, or practically no, chlordinitrobenzene can be detected any longer. The product is then stirred into hot water and allowed to cool, when the insoluble product is filtered off, washed and dried. It consists of almost pure 2-4-dinitroaniline. Similarly, 2-6-dinitro-1-4-dichlorbenzene gives 2-6-dinitro-4-chloraniline, and 2-4-5-7-tetranitro-1-bromnaphthalene gives 2-4-5-7-tetranitro-1-naphthylamine (this last synthesis in presence of dry xylene).

The reaction should be highly valuable, as the older process of amidation, heating with ammonia-water under pressure, is sometimes dangerous, always from the pressure developed by the ammonia, and, in case of some polynitro compounds, from their tendency to explode on heating above a certain temperature, not always to be certainly ascertained—a double danger. The older process also never gives yields which can be regarded as even satisfactory .

Naphthol AS Series Intermediates

British Synthetics, Ltd., and E. B. Higgins; English Patent No. 262,958.—Naphthol AS and its homologues may be prepared by a reaction analogous to the Schotten-Baumann reaction—in fact, it really is the same reaction—by reacting the chloride of 2-hydroxy-3-

naphthoic acid with the base desired, as aniline, in one of three ways:

1. The base is stirred up to a paste with a weak alkali and water, and the acid chloride added under violent stirring. The chloride may be added in solid form, or dissolved or suspended in an indifferent medium, such as benzene.

2. The chloride, solid or dissolved, or suspended in an indifferent medium, is mixed with the amine and a weak alkali, and water stirred in.

3. The chloride, solid or dissolved, or suspended in an indifferent medium, is mixed with the amine and the mixture stirred slowly, with stirring, into a weak alkaline (aqueous) solution.

The alkali used may be soda or sodium bicarbonate. If benzene is used, this is driven off by steam and recovered, and the aqueous liquor from the distillation made neutral to phenolphthalein (to destroy free alkali, since the arylides in question are somewhat soluble in hot sodium carbonate).

Improvement in Dyeing or Printing of Acetate Silk

British Celanese, Ltd.; English Patent No. 269,960 (*addition to English Patent No.* 242,711).—Relates to the dyeing of acetate silk with dyestuffs insoluble or very difficultly soluble in water, this difficulty having been obviated partially by dispersion through the addition of Turkey Red oil or similar sulphonated oils or of higher fatty acids, or sulphonated, etc., derivatives of them, which contain salt-forming groups, such as the sulpho or carboxyl groups or both; or, with salts of such acids, as the alkali or ammonium salts.

Auxiliary solvents, in addition to those described in English Patent No. 219,349, are mentioned in English Patent No. 242,711. Among these are noted halogen-alkyls or alkylenes such as tetrachlorethane, tetrachlorethylene; simple or mixed derivatives of cyclic or aromatic hydrocarbons, which contain one or more amino-, chlorine, or hydroxyl groups, as, for example, the cresols, alkyl-anilines, toluidines, chlor-phenols, mono- or poly-chlorbenzenes, hydrogenated derivatives of these or of other aromatic compounds, such as hexahydrophenol, hexahydrocresols, hexahydrobenzene, decahydronaphthalene, tetrahydronaphthalene, etc.

The present patent replaces the foregoing auxiliary solvents, or adds to the list, by the following: Chlorinated naphthalenes, aromatic hydrocarbons, such as benzene, toluene, xylene, cumene, propyl-benzene, o-methyl-ethyl-benzene, mesitylene, di-phenyl-methane, naphthalene, paraffine hydrocarbons such as heptane, triethyl-methane, nonane, decanaphthene, undecanaphthene, and terpenes, as turpentine or pinene, unsaturated hydrocarbons, as butyl-ethylene, tetramethyl-athylene, cyclopentane, etc., or technical solvents, such as crude turpentine, petroleum, solvent naphtha, or technical benzene.

An example is given: One pound of very finely divided 1-hydroxy-4-amino-anthraquinone is dissolved by boiling in 10 pounds of xylene. The hot solution is poured through a fine sieve into 15 pounds of 50% Turkey Red oil, a quantity of boiling soft water added, and the whole stirred up to a uniform mixture. The clear solution obtained is diluted to 20 gallons with boiling soft water, and this solution stirred into 250 gallons of cold soft water, in which 5 pounds of olive oil soap have been dissolved; 1,000 pounds of cellulose acetate yarns are now entered, and the bath heated during three-quarter hour to 75°, and kept for three-quarter hour further at 75° to 80° C. The goods are then taken out, washed, and further worked up as desired.

Dyestuffs for Rayon (Viscose Type)

British Dyestuffs Corp., Ltd.; English Patent No. 270,883.—Diazo dyestuffs, prepared by coupling two molecules of one diazotized amine, or a molecule each of two different diazotized amines successively, to a second component of the general type of a urea of 2-amino-8-naphthol-6-sulphonic acid. These second components may be prepared, for example, by adding oxalyl chloride gradually to a stirred solution of the sodium salt of the above aminonaphtholsulphonic acid, in presence of an excess of sodium acetate, and salting out the product, or by adding a solution of 478 parts of the above sodium salt to an alcoholic solution of 250 parts of alpha-gamma-dichloracetone, heating to 50°, distilling off the alcohol, and salting out, or in similar ways with other aliphatic halogen linking compounds.

Some dyestuffs of this class are already known, but are not in use, as they have only slight affinity for cotton. It is remarkable that for regenerated cellulose they have good affinity and dye evenly.

Nitrated Mono-Azo Azo-Dyestuffs

I. G. Farben-Ind. A. G.; German Patent No. 445,827.—By coupling diazotized 4-chloraniline-3-sulphonic acid to diphenylamine, nitrosating the dyestuff formed with sodium nitrite in a little water (does the sulpho group of the first component liberate the nitrous acid?), and oxidizing the resulting solution of the nitrosated dyestuff to the corresponding nitro-compound with a mixture of nitric and sulphuric acids. The dyestuff is salted out, converted to the sodium salt, this salted out, filtered off, and dried.

It is claimed that the reaction goes smoothly and so yields a high percent of pure product, as compared with the similar Azo Yellow produced from a non-chlorinated first component. It is also stated that the product has a greater affinity for the fiber, and greater fastness to rubbing, than has the simpler well-known homologue from an unhalogenated first component.

W. L. Pierce, Bellman Brook Bleachery Company, Fairview, N. J., was elected president of the National Association of Finishers of Cotton Fabrics, at the recent election of officers.

DYE IMPORTS INTO THE UNITED STATES DURING 1928

Total imports of synthetic dyes for 1928 were 5,346,169 pounds, with an invoice value of $4,297,203, as compared with 4,182,026 pounds, worth $3,423,918, imported in 1927. The per cent of imports of dyes by country of shipment was as follows:

	Dec., 1927	Dec., 1928	Jan.-Dec., 1927	Jan.-Dec. 1928
Germany	67.5	69	58.20	65.31
Switzerland ..	18.0	24	25.72	24.75
France	4.5		3.17	1.31
England	1.0		3.50	1.76
Belgium	4.5	7	4.71	2.47
Canada	0.5		2.12	2.48
Italy	3.0		2.30	1.40
Netherlands ...	1.0		0.28	0.52

Leading Dyes, by Quantity, Imported During December, 1928

	Pounds
Anthra Yellow GC (single strength)	15,212
Vat Golden Yellow GK (single strength).....	13,958
Rhodamine B Extra (single strength).....	12,520
Alizarine, synthetic	11,467
Vat Red Violet RH (single strength).....	10,675

JAPAN BUYS AMERICAN PACKAGE DYES

Exports of package dyes for household use from the United States amounted to 202,152 pounds during the first eight months of 1928, valued at $146,633. This is the first year that this group has been separately enumerated in export statistics, according to the Department of Commerce.

Japan was the heaviest purchaser, buying 36,762 pounds, valued at $53,783. Canada ranked next with 72,980 pounds, valued at $23,137. Mexico and Argentina bought quantities worth $11,912 and $6,295, respectively, and shipments were made to forty-three other countries.

Consul H. M. Wolcott of Caracas reports that the use of package dyes in Venezuela is on the increase. This has not as yet been reflected in American export trade, which was valued at only $4,583 during the eight months' period, largely because European package dyes are available at lower prices. However, the American dyes are of better quality and more simple in their application, but the average consumer must be educated to economic advantages before he is willing to pay the higher price charge for the American product.

WILL BE ABLE TO PURCHASE TINTING MATERIALS WITH GUARANTEE

Many claims in the silk industry will be eliminated, it is expected, with the working out of a plan by the Commission Throwsters' Division of the Silk Association of America, Inc., whereby the silk industry will be able to purchase its tinting materials with a guarantee as to fugitiveness when used under proper conditions.

Through the co-operation of the United States Testing Company, Inc., tints will be tested and each package distributed will be stamped with the assurance that the tint will prove fugitive when used under the correct conditions.

From a questionnaire which has been sent out to the industry asking all users of tints to report the range of tints in their plants as well as the approximate quantity of each tint consumed during the past year, a color list will be drawn up and the approximate amount necessary for the years' supply determined.

The Commission Throwsters' Division has requested the president of the association to appoint a committee to supervise this undertaking and to co-operate with Testing House officials.

Emil W. Seasongood, formerly vice-president and manager of Mojud Hosiery Dye Works, Inc., has resigned from that company and organized a New York corporation under the name Seasongood Hosiery, Inc., of which he is the president and general manager. Seasongood Hosiery, Inc., will engage in the general hosiery business with a modern and fully equipped plant, specializing in the dyeing and finishing of silk hosiery.

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i. e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

DYER WANTED

Wanted—Experienced technical dyer, graduate of American textile school. Must be a married man with previous experience to take complete charge of silk dyeing department. An exceptional opportunity for the right man. Address: Classified Box 500, American Dyestuff Reporter.

WANTED

Textile chemist-colorist for dyehouse laboratory doing routine and development work. Give details of textile school or college training and experience, if any. Replies should be addressed to Box 501, American Dyestuff Reporter.

POSITION WANTED

As superintendent or assistant superintendent of dyeing and finishing on woolens or worsteds. Now in charge of plant but available on short notice. Good training and experience. Excellent references. Address: Box 499, American Dyestuff Reporter, 90 William Street, New York.